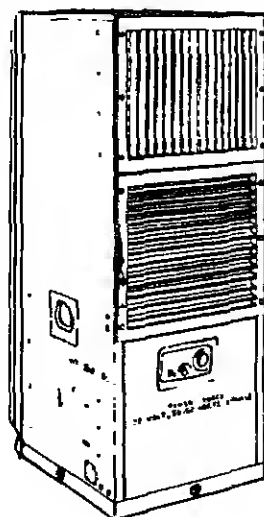


ARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

FOR

AIR CONDITIONER, VERTICAL COMPACT



TYPE I, VERTICAL, SIZE C, 18,000 BTU/HR,
CLASS 1, 208 VOLT, 3 PHASE, 50/60 HERTZ
KECO MODEL F18T-2

This copy is a reprint which includes current

for

AIR CONDITIONER, VERTICAL COMPACT
TYPE I, VERTICAL, SIZE C, 18,000 8TU/HR, CLASS 1,
208 VOLT, 3 PHASE, 50/60 HERTZ KECO MODEL F18T-2
NSN 4120-00-168-1781

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1-1 and 1-2
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Type I, Vertical, Size C, 18,000 BTU/HR,
Class, 208 Volt, 3 Phase, 50/60 Hertz
Keco Model F18T-2 NSN 4120-00-168-1781

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Type I, Vertical, Size C, 18,000 BTU/HR,
Class, 208 Volt, 3 Phase, 50/60 Hertz
Keco Model F18T-2 NSN 4120-00-16B-17B1

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AIR CONDITIONER, VERTICAL COMPACT

Type I, Vertical, Size C, 18,000 BTU/HR,
Class, 208 Volt, 3 Phase, 50/60 Hertz
Keco Model F18T-2 NSN 4120-00-168-1781

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 Keco Model F18T-2 NSN 4120-00-168-1781

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Chapter 6	6-1 and 6-2	6-1 thru 6-2.1/(6-2.2 Bla
	6-3 and 6-4	6-3 and 6-4
	6-5 and 6-6	6-5 thru 6-6.1/(6-6.2 Bla
Chapter 7	7-1 and 7-2	7-1 and 7-2
	7-3 and 7-4	7-3 and 7-4
Chapter 8	8-3 and 8-4	8-3 and 8-4
	8-5 and 8-6	8-5 and 8-6
	8-7 and 8-8	8-7 thru 8-8.1/(8-8.2 Bla
	8-9 and 8-10	8-9 and 8-10
	8-13 and 8-14	8-13 thru 8-14.1/(8-14.2
	8-15 and 8-16	8-15 and 8-16

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DEATH ON CONTACT

may result if personnel fail to observe safety precautions

over work on electronic equipment unless there is another person nearby who is familiar with the operation of the equipment and who is competent in administering first aid. When the technician is aided by others, he must warn them about dangerous areas.

Whenever possible, the power supply to the equipment must be shut off before beginning work on the equipment. Take particular care to ground every capacitor likely to hold a dangerous potential. When working inside the equipment, after the power has been turned off, always ground every part before touching it.

Be careful not to contact high-voltage connections of 208 volt ac input connections when installing or operating the equipment. Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body. Do not operate the equipment without covers, doors, and guards in place and tightly secured. *Warning: Do not be misled by the term "low voltage." Potential as low as 50 volts may cause death under adverse conditions.*

WARNING

REFRIGERANT UNDER PRESSURE

is used in the operation of this equipment.

DEATH

Severe injury may result if you fail to observe safety precautions. Never use a heating torch on any part that contains Refrigerant — 22. Do not let liquid refrigerant touch you, and do not inhale refrigerant gas.

WARNING

The burning of polyurethane foams is dangerous. Due to the chemical composition of a polyurethane foam, toxic fumes are released when it is burned or heated. If it is burned or heated indoors, such as during a welding operation near by, you should take care to ventilate the area thoroughly. An exhaust system like that of a paint booth should be used. Air-supplied respirators, approved by the National Institute for Occupational Safety and Health or the US Bureau of Mines, should be used for all welding in confined spaces and in places where ventilation is inadequate. Persons who have chronic or recurrent respiratory conditions, including allergies and asthma, should not work in these areas.

WARNING

Clean parts in a well-ventilated area. Avoid inhalation of solvent fumes and prolonged exposure of skin to the solvent. Wash exposed skin thoroughly. Dry cleaning solvent (Fed. Spec. P-D-680) used to clean parts is highly dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C). Wear eye protection when blowing solvent from parts. Air pressure should not exceed 30 psig (2.1 kg/cm²).

Operator, Organizational, Direct Support
and General Support Maintenance Manual
for
Air Conditioner, Vertical Compact
Type I, Vertical, Size C, 18,000 BTU/HR,
Class 1, 208 Volt, 3 Phase, 50/60 Hertz
KECO Model F18T-2
NSN 4120-00-168-1781

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistake or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, U.S. Army Troop Support Command, ATTN: AMSTR-MCTS, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1781. A reply will be furnished directly to you.

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Section I. GENERAL INFORMATION

Scope

This manual contains information on the operation, servicing and maintenance of the compact vertical conditioner, Model F18T-2, manufactured by Carrier Industries, Inc., Cincinnati, Ohio. Chapter 1 through 3 comprise operating and servicing instructions for the operator. Chapter 4 comprises maintenance instructions concerning mechanical and electrical components for Organizational Maintenance personnel. Chapters 5 through 11 provide testing, adjustment and replacement instructions for specific systems and components, to be used by Direct and Indirect Support Maintenance personnel.

The purpose of the air conditioner is to circulate, cool or heat filtered air in a room or other enclosure in which it is installed (see figure 1-1). The unit provides 12,000 Btu/hr. of cooling or 12,000 Btu/hr. of heating capacity. A two-speed fan can be set for either low- or high-speed operation, using a manually operated switch on the control panel; however, an automatic, over-ride switch may over-ride the manual switch when it is set for low speed. This feature pro-

vides automatic control of head pressure, increases cooling efficiency.

1-2. Maintenance Forms and Records

Department of the Army forms and procedures used for equipment maintenance will be those prescribed in DA PAM 738-750, the Army Maintenance Management System (TAMMS).

1-3. Reporting Equipment Improvement Recommendation (EIR'S)

EIR's can and must be submitted by anyone aware of an unsatisfactory condition with the equipment design or use. It is not necessary to show design or list a better way to perform a procedure; simply tell why the design is unfavorable or why the procedure is difficult. EIR's may be submitted on Standard Form (SF) 368. Mail directly to AMSTR-QX, US Army Troop Support Command, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. A response will be furnished to you.

Section II. EQUIPMENT DESCRIPTION

Purpose of F18T-2 Air Conditioner

F18T-2 Air Conditioner is designed to circulate, cool or heat filtered air in a room or other enclosure in which it is installed.

ABILITIES AND FEATURES

Major Components:

Compressor

Evaporator Coil

Condenser Coil

Evaporator/Condenser Fans

Solenoid Valves

Expansion Valves

Pressure Cutout Switches

Sight-glass Liquid Indicator

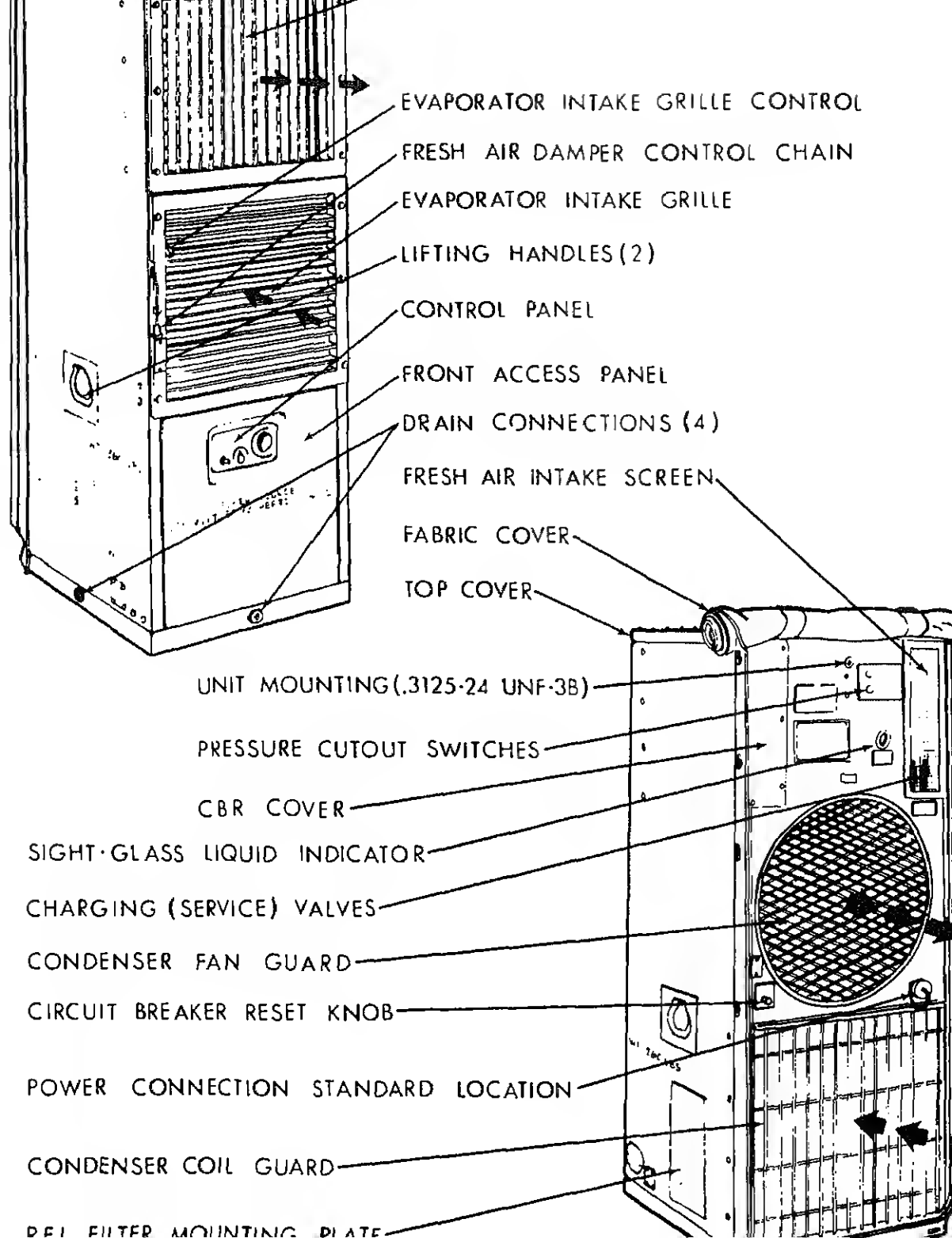
SPECIAL FEATURES

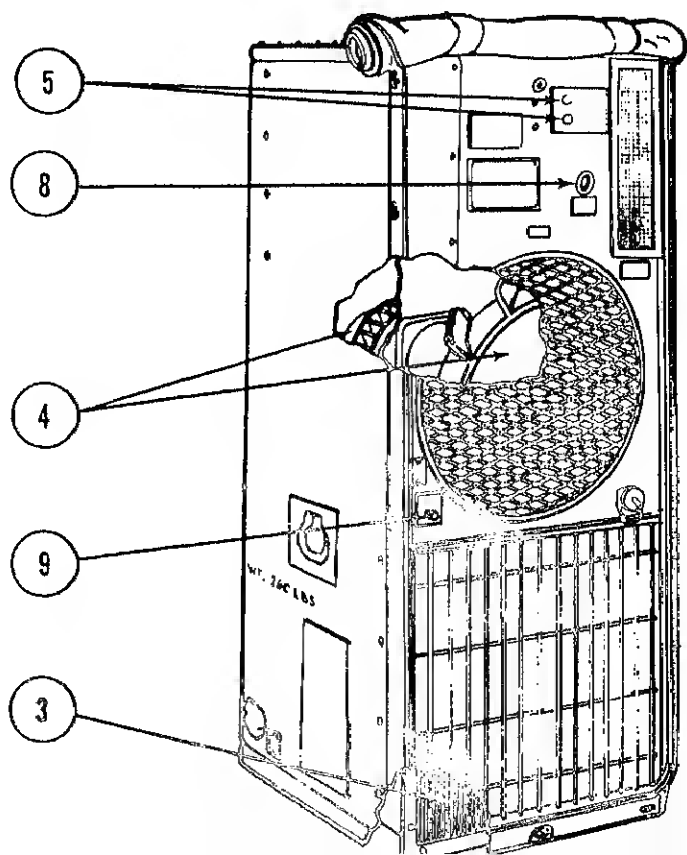
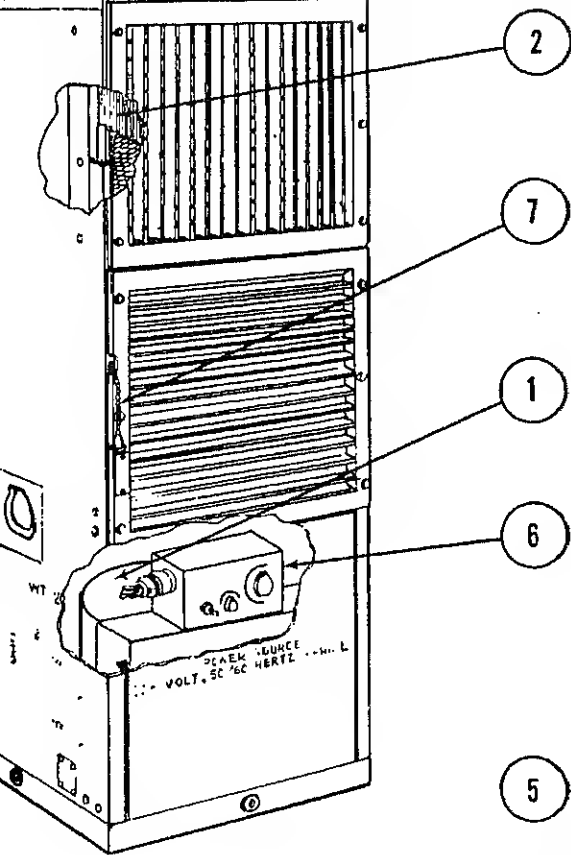
a) Remote Control Capability

1-5. Location and Description of Major Components (see figure 1-2)

Compressor (1). It consists of a reciprocating compressor driven by an electric motor, hermetically sealed into a steel container with a lifetime oil. A crankcase heater surrounds the lower portion of the container. The heater is thermostatically controlled to prevent migration of liquid refrigerant into the crankcase where it would become mixed with the oil.

Evaporator Coil (2). Is made up of intercoiled





is the means for mounting the coil in the air conditioner, and for supporting the mist eliminator.

Condenser Coil (3). Similar in construction to the fixed, multiple-tube evaporator coil.

Evaporator/Condenser Fans (4). The evaporator impeller is centrifugal, and the condenser fan impeller is of the axial type.

Solenoid Valves. There are two solenoid valves. The liquid line solenoid valve, which closes the line to the evaporator coil when energized, is located in the rear chamber of the air conditioner, to the right of and behind the compressor. The pressure equalizer solenoid valve is located at the top rear portion of the air conditioner.

Expansion Valves. The valve controlling refrigerant flow to the evaporator coil, is located behind the evaporator coil, and can be identified by the three distribution lines that connect it to the coil. The quench line expansion valve is located near the back wall in the upper part of the air conditioner.

Pressure Cutout Switches (5). They are both manually reset limit switches, and are connected through capillary tubes to the discharge and suction lines of the refrigeration system. If refrigerant pressure falls below the minimum set for the low-pressure cutout switch, or the pressure exceeds the maximum set for the high-pressure switch, the electrical connection through the compressor relay is opened to stop the compressor.

Control Panel (6). Contains the following electrical controls; fan speed switch, thermostat and mode selector switch.

Fresh Air Damper Control (7). Is a bead chain that connects to a spring loaded door that controls fresh air intake. Lift chain and pull to close fresh air door.

Light-glass Liquid Indicator (8). The condition of liquid refrigerant flowing through the system can be observed through this window when the compressor is

running. The color of the refrigerant is compared with that of the refrigerant; green, chartreuse and yellow. Green indicates that the refrigerant contains no moisture. Chartreuse and yellow indicate the presence of moisture, and the need to replace the filter-drier and refrigerant. A milky or bubbly appearance of the refrigerant indicates that the system contains insufficient refrigerant, and that more refrigerant must be added.

Circuit Breaker Reset Knob (9). The circuit breaker controls power to the air conditioner. A push-button flexible cable connects the circuit breaker to the control knob.

1-6. Performance Data

OPERATING TEMPERATURES

LOW	-50°F (-45°C)
HIGH	+120°F (+49°C)

PERFORMANCE

COOLING CAPACITY	18,000 Btu/hr
HEATING CAPACITY	12,000 Btu/hr

POWER REQUIRED

VOLTAGE	208
PHASE	3
HERTZ	50/60

DIMENSIONS

WIDTH	17.25 in. (43.8 cm)
DEPTH	20.00 in. (50.8 cm)
HEIGHT	46.5 in. (118 cm)
WEIGHT	260 pounds (118 kg)

REFRIGERANT

TYPE	R22
CHARGE	4.0 + 0.2-0. pound (1.8 + 0.1-0.0 kg)

OPERATING INSTRUCTIONS

Chapter I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS

Operator's Controls and Technical Principles of Operation

CAUTION

Before turning on any of the air conditioner's operating controls, make sure that the fabric cover is rolled up and secured, and that evaporator intake and discharge grilles are fully open.



The compressor crankcase heater must be energized at least 4 hours before the compressor is allowed to start. Liquid refrigerant and oil migration to the compressor crankcase can cause severe damage to compressor instantly on startup in this condition. This condition and damage can be prevented by applying power to unit at least 4 hours prior to startup of compressor. The crankcase heater will vaporize liquid refrigerant in compressor crankcase where energized and allowed enough time to heat compressor to cut out temperature of crankcase heater thermostat. Unit may be operated in ventilation mode during time of crankcase heating which will save power is applied to unit. When this unit is used with an enclosure that has a main circuit breaker and an air conditioning circuit breaker and is connected to a continuous power source, the two circuit breakers should be left in on position so compressor will stay at operation temperature and ready for instant use without danger of severe damage at startup.

a. *Control Panel.* The control panel is the small rectangular panel located in the upper middle part of lower panel. It contains the following operating controls. (See figure 2-1.)

(1) *Mode Selector Switch.* The mode selector switch is a rotary, five-position switch on the right hand side of the control panel. The positions are marked OFF, VENTILATE, COOL, LO HEAT, HI HEAT.

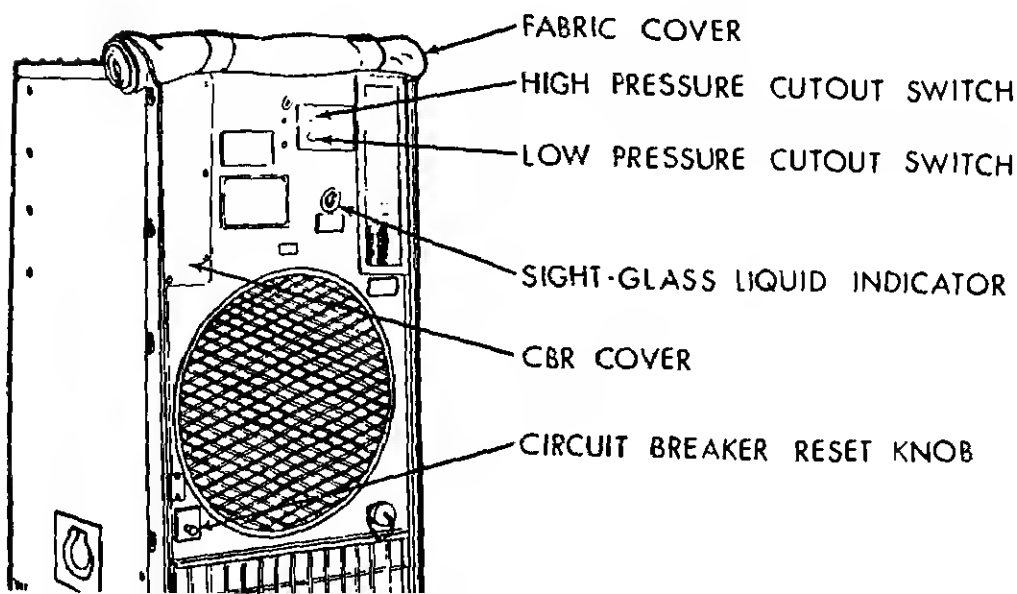
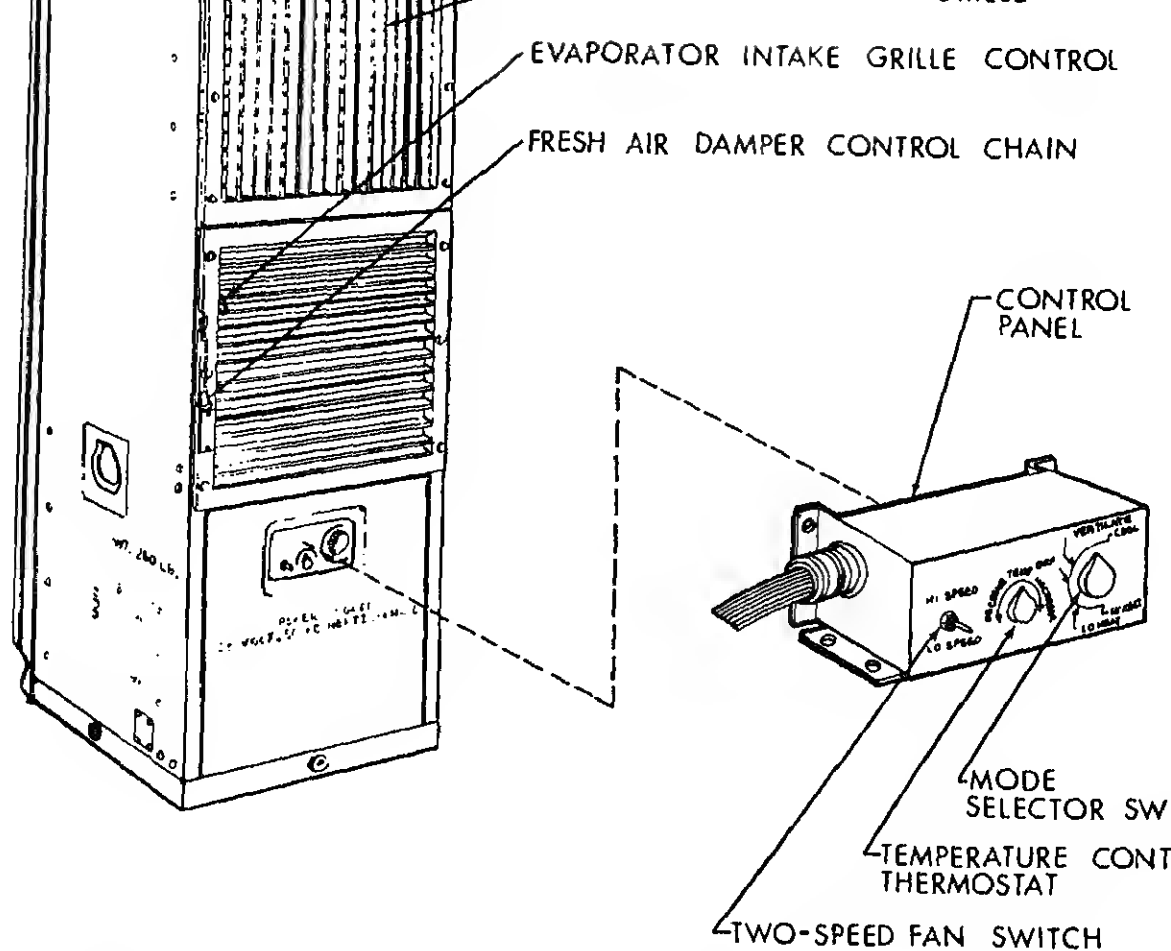
(a) *Ventilating Mode.* When the mode selector switch is set at VENTILATE, only the two-speed fan will operate. Volume of airflow can be varied to either HI SPEED or LO SPEED by setting the two-speed fan switch on the control panel to the desired position. Outside air can be admitted through the fresh air damper, controlled by a pull-chain located about 6 feet away up the left side of the air conditioner.

NOTE

The air conditioner can be equipped for operation in chemical-biological-radiological (CBR) environment by connecting filtering equipment to the rectangular covered opening at the upper left side of the rear surface of the unit.

(b) *Cooling Mode.* When the selector switch is set at COOL, power is connected to the two-speed fan, the compressor, and the various controls and refrigerant needed to operate and control the refrigeration system. When the temperature control thermostat is turned to a setting below the ambient temperature of the room, the typical cooling cycle begins to operate in the following manner. (See refrigeration diagram figure 2-2).

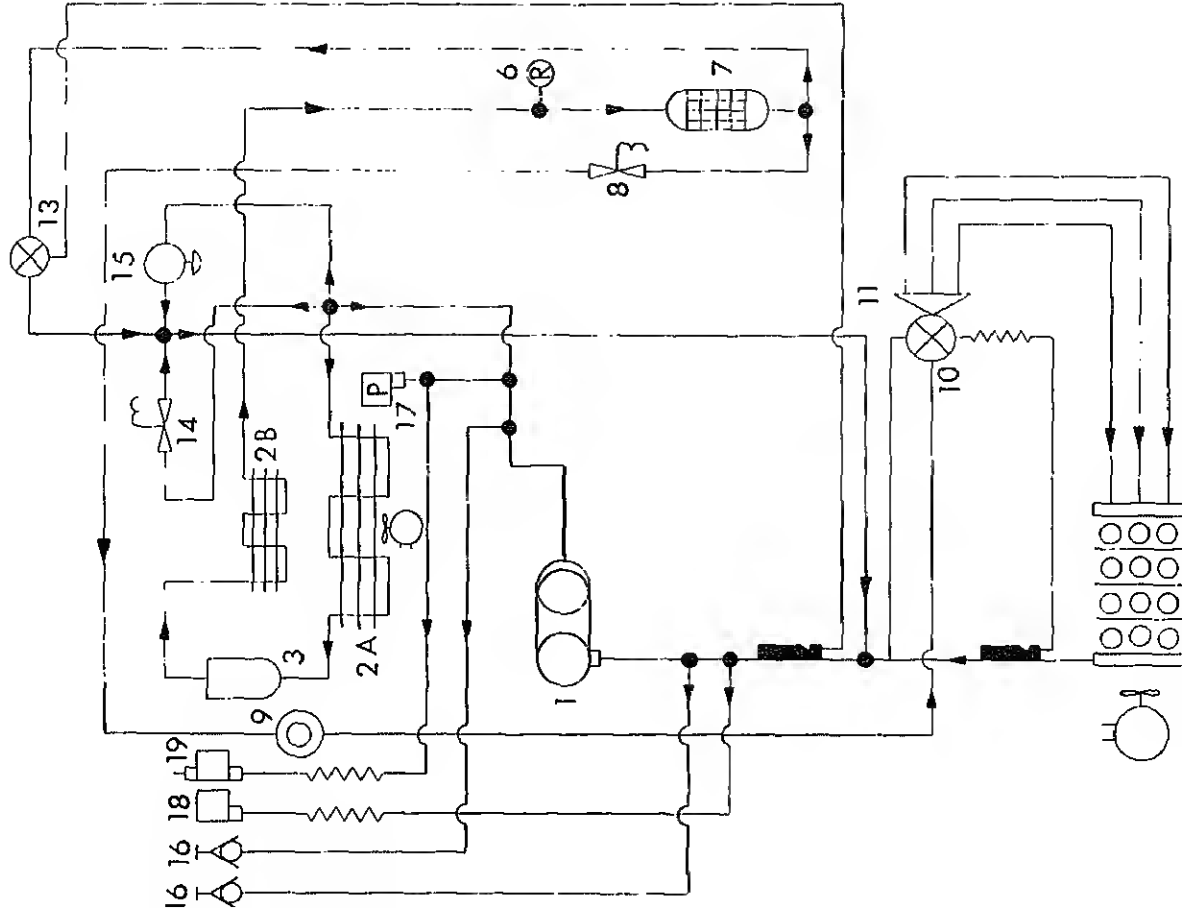
1. *Cooling Cycle.* Cooling takes place when the liquid refrigerant changes to vapor in the evaporator coil (12). This change from liquid to vapor absorbs heat from the air passing over the outside surface of the evaporator coil, thereby cooling the air.



condensing it to a liquid. The liquid refrigerant flows through a filter-drier (7) and the sight-glass liquid indicator (9) as it goes to the expansion valve (10) which meters the refrigerant into the evaporator to repeat the cycle. A pressure regulating valve (11) prevents the development of too low a pressure in the compressor suction line, by opening at a preset pressure to adjust compressed vapor into the suction line. Pressure switch (17) closes at a preset pressure to override the manual two-speed fan switch if set at LOW SPEED.

2. *Bypass Cycle.* The compressor (1) operates continuously when the selector switch is set at COOL. When actual cooling is not required the system goes to bypass operation to prevent build-up of excessive pressures. Bypass operation is initiated when the temperature control thermostat causes the liquid line solenoid valve (8) to shut off refrigerant flow to the evaporator coil (12), and as the suction pressure drops, hot gas bypasses thru the pressure regulating valve (15). In the bypass configuration, vapor is piped from the discharge side of the compressor to the suction side. To prevent the development of excessive pressure by constant recompression, a second expansion valve is used in the system. This expansion valve (13) meters liquid refrigerant into the suction side of the bypass circuit to reduce, or quench the heat.

(c) *Heating Mode.* When the selector switch is



1. Compressor (3 Phase, 50/60 Hz, 208 Volt)
- 2A. Condenser Coil
- 2B. Subcooler Coil
3. Receiver
4. (Not Used)
5. (Not Used)
6. Pressure Relief Valve
7. Filter-drier (Dehydrator)
8. Solenoid Valve (Evaporator)
9. Sight-glass Liquid Indicator
10. Expansion Valve (Evaporator)
11. Distributor
12. Evaporator Coil
13. Expansion Valve (Liquid (Quench))
14. Solenoid Valve (Bypass)
15. Pressure Regulating Valve
16. Service Valve
17. Pressure Switch (two-speed fan)
18. Low-pressure Switch (Circuit Switch)
19. High-pressure Cutout Switch

switch. Three of the elements are controlled by the temperature control thermostat, while the remaining three are on at all times. The ventilating fan also operates at all times. When the selector switch is set at LO HEAT, only the three thermostatically controlled elements are energized.

(2) *Temperature Control Thermostat.* The temperature control thermostat is a rotary, continuously variable control located in the middle of the control panel. It is marked DECREASE TEMP INCREASE above a semi-circular double-ended pointer. The thermostat controls the degree of heating and cooling and should be set at a point at which all inhabitants of the area agree, or the ranking person decides, is comfortable.

(3) *Two-speed Fan Switch.* The two-speed fan switch is located at the left-hand end of the control panel. It is a two-position toggle switch, marked HI SPEED and LO SPEED. When set at LO SPEED the evaporator/condenser fan motor operates at 1725 rpm. At HI SPEED, the fan speed is increased to 3450 rpm. The switch may be set at either position, as desired, for any mode of operation; however, if it is set at LO SPEED when the air conditioner is operating in the COOL mode, an automatic pressure switch may over-ride the manual switch to operate the fans at the higher speed.

b. Airflow Controls. Airflow is controlled by the proper adjustment of louver blades in the evaporator intake and discharge grilles, the fresh air damper, and when installed, the chemical-biological-radiological (CBR) filtering system.

(1) *Evaporator Intake Grille.* When the air conditioner is operating in any mode, and is recirculating room air exclusively, the evaporator intake louvers should be in their fully open position. When either the fresh air damper is open or the CBR filter is attached, the evaporator intake grille should be partially closed to compensate for the outside air being introduced. (See figure 2-1.)

(2) *Evaporator Discharge Grille.* The evaporator discharge grille, located at the top part of the air conditioner, should always be open. The louvers are provided to control the direction of airflow, and should never be closed to the extent that they would obstruct free passage of air. Two sets of louvers are incorporated in the grille: vertical and horizontal. The vertical louvers should be individually adjusted to direct the conditioned air to one or both sides, as desired. The lower horizontal louvers should be adjusted to

desirable to direct cool air slightly downward and warm air slightly downward for maximum comfort and coverage.

(3) *Fresh Air Damper.* Fresh air is introduced through the rectangular screened opening at the right-hand corner of the rear surface of the air conditioner. A damper inside the screened opening controls the volume of air admitted. The variable damper located to the left of the evaporator grille is controlled by means of a ball and wedge slot to retain its position. The evaporator grille should be closed about half way to restrict the introduction of fresh air. (See figure 2-1.)

NOTE

Under all but extreme weather conditions, it is desirable to introduce about 10 percent of fresh air into the system. This helps maintain a slight positive pressure, and tends to eliminate the musty odors associated with stale air.

c. Resetting Automatic Controls. The automatic controls can stop the air conditioner for safety. They can be manually reset. They are the following:

(1) *Circuit Breaker.* The circuit breaker is designed to trip whenever an electrical short circuit exists in the compressor circuit. The circuit breaker itself is located in the junction box. It is reset by means of a push-pull flexible lever. (See figure 2-1.) When it is suspected the circuit breaker has tripped, pull then push the lever. If the knob to re-establish current to the air conditioner, the circuit breaker cannot be reset, or it trips again, as it is reset, report the trouble to maintenance.

(2) *High-pressure Cutout Switch.* The high-pressure cutout switch is mounted in the rear of the air conditioner. The rear surface of the air conditioner has a button and instruction plate providing instructions for resetting the switch after it has tripped. Press and hold the button to reset the switch. If ineffective, report the trouble to organizational maintenance.

(3) *Low-pressure Cutout Switch.* The low-pressure cutout switch is located next to the high-pressure cutout switch, but trips when refrigerant pressure drops below a preset minimum. Press and hold the button to reset the switch. If ineffective, report the trouble to organizational maintenance.

n plate is mounted below the sight glass on the part of the rear casing. It shows green,

be reported to organizational maintenance figure 2-1.)

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

General

Preventive maintenance checks and services are required to keep the air conditioner operating efficiently and to prevent damage caused by neglect. Table 2-1 contains the listing of periodic checks and services required.

Before You Operate. Always keep in mind the PRECAUTIONS and WARNINGS. Perform your before operation PMCS.

b. While You Operate. Always keep in mind the PRECAUTIONS and WARNINGS. Perform your operation (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails To Operate. Do not shoot with proper equipment. Report any deficiencies using the proper forms, TM 38-750.

Table 2-1.
Preventive Maintenance Checks and Services

Before W - Weekly

During M - Monthly

	Interval				Item to be Inspected	Procedures Check for and have repaired or adjusted as necessary	Equipment will be reported not ready/available, if:
	B	D	W	M			
•					Louvers & Grilles (See figure 2-1.)	Check all louvers and grilles for unobstructed openings or damage	Grilles are damaged
			•		Air filters	Check for obstruction, dirt, damage	
		•	•		Sight-glass liquid indicator (See figure 2-1.)	Check sight-glass for damage, bubbles or milkiness, or yellow color	Sight-glass broken indicates low refrigerant level or moisture
			•		Operating controls (See figure 2-1.)	Check control knobs for security and damage	Control knobs missing or damaged
			•		Fabric cover (See figure 2-1.)	Check cover for tears, punctures, damaged fasteners	
			•		Fresh air damper (See figure 2-1.)	Check freedom of operation	

2-4. Operating Check

CAUTION

Do not perform the following operating checks until at least four hours after power has been connected to the air conditioner if it has been stored at below-freezing temperatures within the past 24 hours. If knocking or pounding noises are heard when the compressor is started, shut down at once. Leave power connected to the unit, and wait an additional two hours before attempting another start.

Check operation of the air conditioner in each operating mode, as directed in the following steps:

a. Unzip and roll up the fabric cover on the rear of the unit. Secure with two straps, and fasten with two turnbutton fasteners.

b. Using the operating lever, open the louvers of the evaporator air intake grille to their fully open positions. Open both the vertical and the horizontal louvers in the evaporator air discharge grille to their open position.

c. Position the two-speed fan switch on the control panel at LO SPEED, and turn the mode selector switch to VENTILATE. Check airflow with smoke or a paper streamer at both evaporator discharge and condenser discharge grilles.

d. Position the two-speed fan switch at HI SPEED, and observe increased airflow.

e. Turn mode selector switch to LO HEAT and turn temperature control thermostat to its full INCREASE position. Feel evaporator discharge air with the hand to check for warmth. Turn mode selector switch to HI HEAT, and note increase in warmth of airflow.

f. Turn selector switch to VENTILATE for one minute, then turn it to COOL. Turn the temperature control thermostat to its full DECREASE position. Note that cool air is discharged from evaporator discharge grille.

g. Turn mode selector switch to OFF, and observe that all functions stop.

ting of louver blades in the evaporator grille, and does not require changing or adjustment to accommodate seasonal desired change in the pattern of cover.

b. Starting. Normally, the air conditioner starts whenever the mode selector switch is in any of the four operating positions: VENTILATE, LO HEAT or HI HEAT, provided that the unit is connected to the proper power supply (208-volt, 60 Hertz, ac). If the air conditioner fails to start, trip the circuit breaker by means of the pull-out switch on the back of the unit. If the air conditioner starts, and you have determined that the unit is operating, disconnect the electrical power to the unit for trouble to organizational maintenance.

c. Stopping. You can stop the air conditioner in any mode of operation by turning the mode selector switch to OFF. Do not disconnect power to the unit.

d. Modes of Operation.

CAUTION

The fabric cover must be rolled up and secured while the air conditioner is operating in any mode.

Refer to Table 2-2 for the control panel functions to obtain the desired mode of operation.

2-6. Preparation for Movement

No exceptional preparation is required for movement of the air conditioner. The air conditioner is to be routinely moved by the operator. Simply close the evaporator intake grille louvers, and close the fabric cover fastener.

2-7. Decals and Instruction Plates

The air conditioner incorporates several decals and instruction plates: (See Table 2-3.)

a. Military Identification Plate. The identification plate is mounted just to the left of the sight indicator, displays the description, National Stock Number, and name of the manufacturer of the equipment.

b. Refrigerant Type and Charge Plate. This plate contains the type and charge (by weight) of the refrigerant. It is located above the sight indicator.

g- 100% ulated Air	COOL	Desired Temperature	Closed	Open	Open
g- with akeup air	COOL	Desired Temperature	Partially or fully open	Partially or fully closed*	Open
g- with akeup air h CBR	COOL	Desired Temperature	Closed	Partially or fully open†	Open
g- 100% ulated Air	LO HEAT or HI HEAT	Desired Temperature	Closed	Open	Open
g- with akeup air	LO HEAT or HI HEAT	Desired Temperature	Partially or fully open	Partially or fully closed*	Open
g- with akeup air h CBR	LO HEAT or HI HEAT†	Desired Temperature	Closed	Partially or fully open*	Open
ation- um r air	VENTILATE	Any Setting	Open	Closed	Optional

al closing of the evaporator intake grille causes a greater portion of the total airflow to be drawn from the return air.

the high- and low-pressure cutout switch reset buttons, and states, PUSH TO RESET. It is located below the sight-glass liquid indicator.

Sight-glass Color Change Plate. This plate is located immediately below the sight-glass liquid indicator and displays three colors for comparison to the color of the liquid refrigerant, green (dry), chartreuse (moist) and yellow (wet).

Fan Rotation Plate. This plate, located at the 12 o'clock position above the condenser fan guard, displays an arrow indicating the proper fan direction.

Circuit Breaker Reset Plate. This plate, located below the circuit breaker reset knob, contains the instructions PULL AND PUSH TO RESET CB.

Gauge Access Plate. This plate, located below the air screen states, REMOVE SCREEN TO IN-

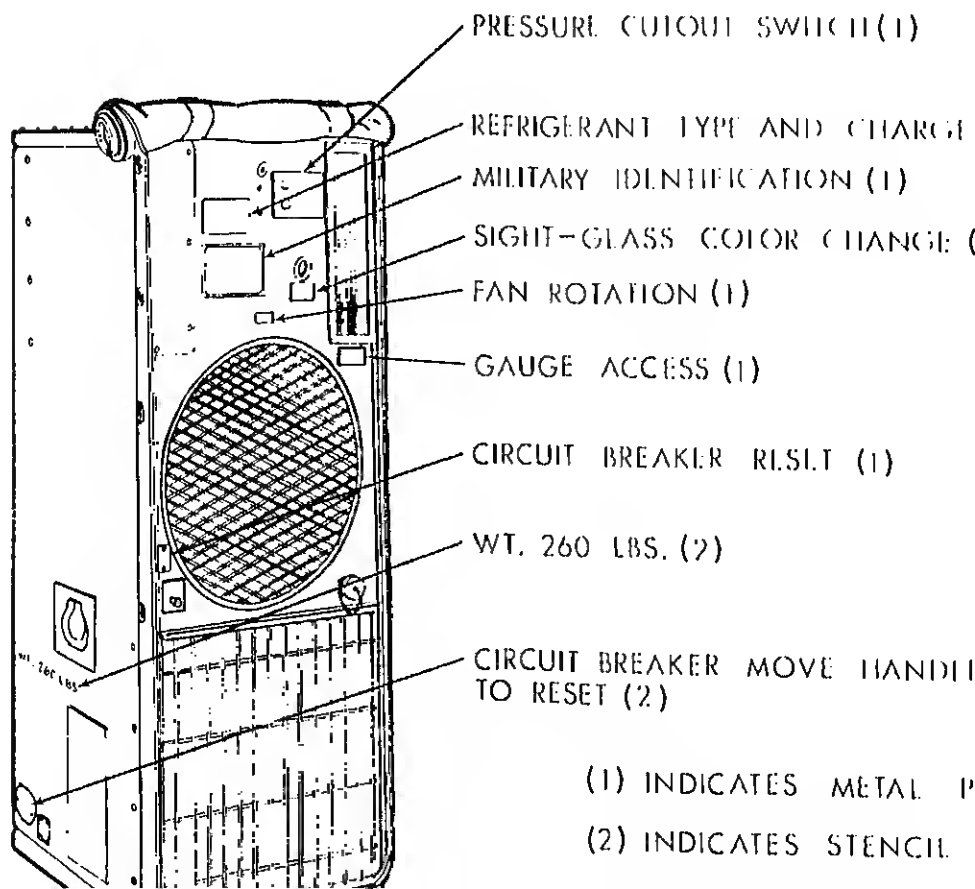
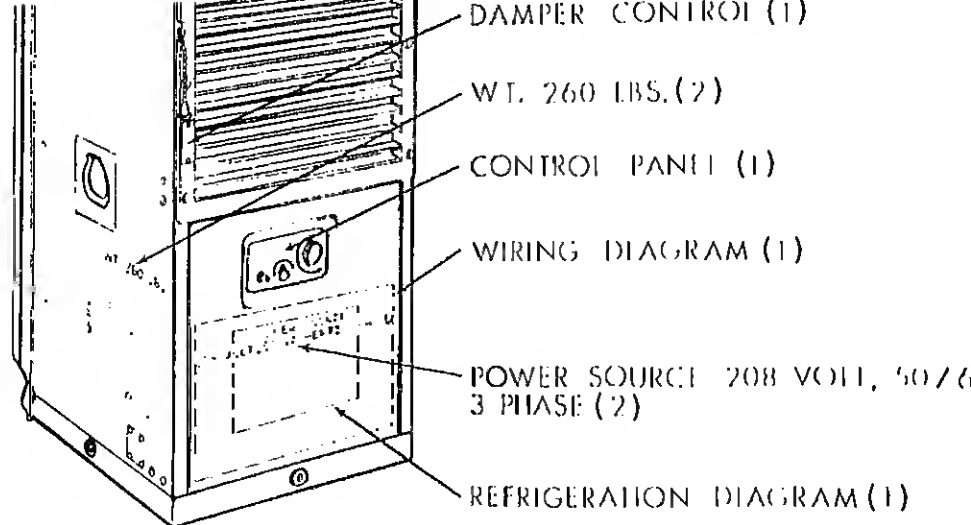
h. Damper Control Plate. Mounted on the left side of the evaporator intake grille, this plate states, FRESH AIR DAMPER CHAIN PULL TO CLOSE.

i. Control Panel Plate. This plate is the face of the control panel. It contains the two-speed fan selector switch (HI SPEED, LO SPEED), the temperature control thermostat (DECREASE TEMP INCREASES SPEED), the mode selector switch (COOL, VENTILATE, LO HEAT, HI HEAT).

j. Refrigeration Diagram. This plate, located on the junction box cover, contains a schematic diagram of the refrigeration system.

k. Access Plate. Located at the front of the unit on the right side, this plate contains the words: CIRCUIT BREAKER MOVE HANDLE UP TO RESET.

l. Wiring Diagram Plate. This plate is located on the



(1) INDICATES METAL PLATE

(2) INDICATES STENCIL

servicing procedures to maintain high efficiency and prevent undue strain or wear of the equipment.

Operation in Extreme Heat

The air conditioner is designed to operate in temperatures up to 120°F (49°C). At extremely high temperatures, extra care should be taken to reduce the load of the enclosure by checking openings and doors and windows to be sure that they are closed, using window shades to shut out direct light from the sun, limiting the use of electric lights and heat producing equipment; and limiting the infiltration of outside air through the fresh air damper unit.

Operation in Extreme Cold

The air conditioner is designed to operate in temperatures as low as -50°F (-45°C). At extremely low temperatures, extra care should be taken to reduce the loss of the enclosure, by weather-stripping windows and doors, insulating surfaces exposed to the elements, and limiting the amount of outside air drawn through the fresh air vent of the air conditioner. Do not disturb wiring during extremely cold weather. The insulation becomes brittle, and is easily damaged.

Operation in Dusty or Sandy Conditions

Oil and dust can seriously reduce the efficiency of the air conditioner by obstructing the air filter and reducing airflow. Clean the air filter daily, if necessary, to provide unobstructed airflow. Limit the amount of air drawn in through the fresh air damper. Repairs should be made to increase the frequency of cleaning the mist eliminator and checking the drain from the drip pan and the base plate. Keep the fabric cover zipped closed when the air conditioner is not in use.

The fabric cover should be closed when the air conditioner is not in use. The fabric cover should be opened after dry spells, to permit the interior to dry out.

2-13. Operation in Salt Air or Sea Spray

To prevent the accumulation of salt on exposed surfaces, the fabric cover should be kept closed when the air conditioner is not operating. Exposed areas should be spray-rinsed or sponged with clear water periodically to remove salt encrustations.

2-14. Emergency Procedures

a. CBR Hazard. When operating under chemical-biological-radiological (CBR) conditions, a CBR filtering unit to the intake on upper right side of the surface of the unit. Close fresh air damper control and make sure that evaporator intake and discharge louvers are open.

b. Power Reduction. To conserve available power during periods when full 208-volt, 3-phase power is not available, the air conditioner should be operated in the VENTILATE mode only.

2-15. Administrative Storage

a. Store equipment so as to provide maximum protection from the elements and to provide access for inspection, maintenance and exercising. Arrange for removal or deployment problems, and take necessary precautions.

b. Take into account environmental conditions such as, extreme cold or heat; high humidity; snow; earthquakes; or combinations thereof, and take adequate precautions.

c. Establish a fire plan, and provide for fire precautions.

4. REDUCED COOLING CAPACITY.

- Step 1.* Check temperature control thermostat setting.
Set thermostat at maximum DECREASE.
- Step 2.* Check fresh air damper to be sure that it is not admitting too much hot, humid air.
Adjust fresh air damper.
- Step 3.* Check for open doors, windows or operating exhaust fans in conditioned area.
Close doors and windows. Turn off or reduce speed of exhaust fans.
- Step 4.* Verify that evaporator intake and discharge louvers are properly adjusted (open).
Adjust louvers correctly.
- Step 5.* Make sure that fabric cover is rolled up and stowed.
Open fabric cover.
- Step 6.* Check condenser intake screen for dirt or obstruction.
Clean screen or remove obstruction.
- Step 7.* Make sure that all cover plates and panels are in position and are sealing the lower cover.
Cover and seal any non-functional openings.

5. REDUCED HEATING CAPACITY.

- Step 1.* Check selector switch setting.
Set selector switch to HI HEAT.
- Step 2.* Check fresh air damper position to be sure that it is not admitting too much cold air.
Close fresh air damper.
- Step 3.* Check evaporator intake and discharge louvers for proper (open) position.
Open louvers.
- Step 4.* If thermostat is remotely located, check to be sure that it is not close to light bulbs or other equipment.

General

Repair parts are listed and illustrated in 5-4120-360-24P. No special tools are required for maintenance of the equipment. Test, maintenance

and diagnostic equipment (TMDE) and support equipment include standard pressure and vacuum gauges, vacuum pump and charging manifolds found in standard equipment in any refrigeration shop.

Section II. SERVICE UPON RECEIPT OF EQUIPMENT

Unpacking

The air conditioner is bolted to the wood shipping crating, which must be removed when the unit is to be installed in a permanent location. Proceed as follows:

Cut the steel strapping, and carefully remove the wooden crating and plastic wrapping from the unit.

With the help of at least one assistant, lay the air conditioner on either side, supported by cushioned port blocks such as two 2-foot lengths of 4 x 4 lumber.

Remove four 7/16 - 14 bolts securing the shipping crating to the air conditioner's base plate. These bolts should be retained if needed for permanent mounting of the unit. (See figure 2-1.)

Return the unit to the upright position, ready for installation.

Checking Unpacked Equipment

Check the air conditioner in accordance with the following instructions:

Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packaging Improvement Report.

Check the equipment against the packing slip to verify if the shipment is complete. Report all discrepancies in accordance with the instructions of TM 38-750.

Check to see whether the equipment has been modified.

Perform all weekly and monthly preventive maintenance checks and services, as indicated in figure 2-1.

Installation Instructions.

Observe the following requirements and recommendations when installing the air conditioner.

The unit should be installed on a level supporting surface to permit uniform condensate drainage. If a

level surface is not available, be sure to connect the condensate drain to a drain opening in the lowest side of the base plate. Drain plugs are located in the middle of each side of the base plate. Standard 1/2 - 14 NPT fittings can be installed in place of one or more of these plugs to direct condensate drainage to a drain, storm sewer, or dry sump, or a standard garden hose may be used.

b. Rough-in Dimensions. An opening 18-1/2 inches (47 ± 1 cm) wide, and 49 ± 1/2 inches (124 ± 1 cm) high is required for installation of the air conditioner. A removable filler plate should be installed above the unit to permit ready removal of the panel for servicing. Space between the air conditioner and the wall may be filled with flexible plastic foam and sealed with pressure-sensitive tape.

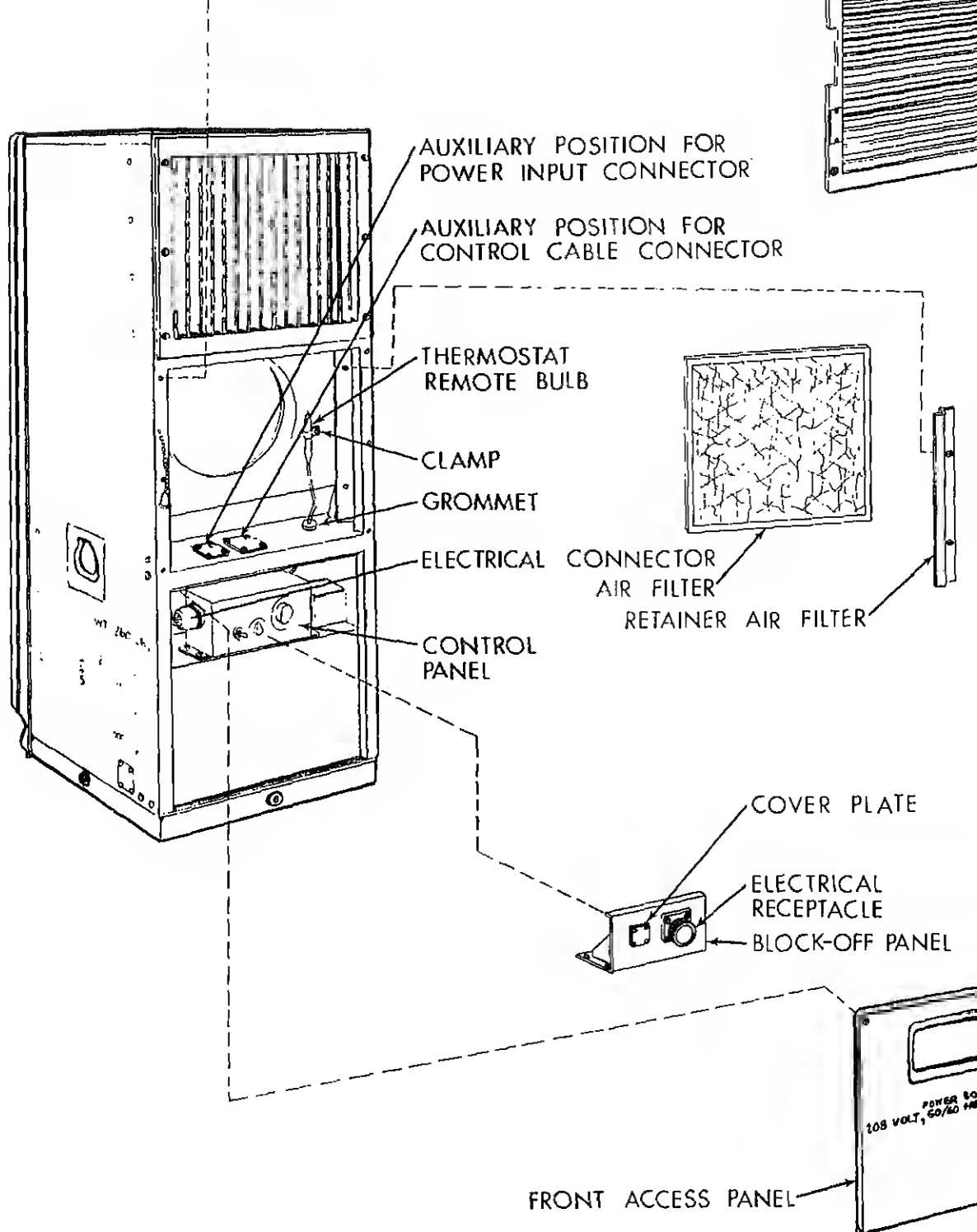
c. Mounting. The air conditioner should be bolted or lag-screwed to a flat, level surface. The base plate contains four mounting holes, equipped with 7/8 inch clinch nuts if bolting from below is required. The clinch nuts may be driven out if bolting or lag-screwing from above is necessary. (See figure 4-1.)



If utilizing the four clinch nuts for mounting, a new bolt, with no lubrication, should be used. The mounting bolt shall not be torqued more than 15 foot-pounds to prevent deforming the clinch nut plate or dislodging the clinch nut from the plate.

d. The air conditioner must have an unobstructed flow of air in order to operate efficiently. Make note of terrain features, trees, and other buildings if possible to provide a shaded location without obstructing air. This minimizes the cooling load on the refrigeration system.

e. The unit should be located as near as possible



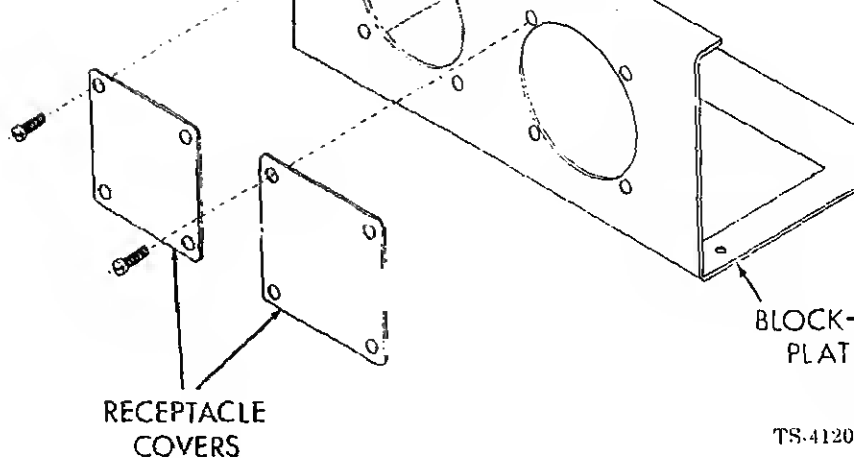


Figure 4-3. Block-Off Panel

o'clock position below the condenser fan guard. If the normal location is inconvenient, the receptacle may be moved to either side or to the space between the evaporator intake grille and the air filter by removing four screws, lock washers and nuts from the flange of the receptacle, and transferring it to the desired location. Also, transfer the cover plate from the new location of the receptacle to the original location. Secure each with four screws, lock washers and nuts.

f. A ground connection should be made between the casing and the earth, using bare wire (No. 10 AWG). The ground end of the wire may be connected to a cold water pipe or to a copper or brass rod driven at least 14 inches into the earth.

g. Before operating the air conditioner make sure that the fabric cover is rolled up and secured, and that the evaporator air intake and discharge louvers are fully open.

h. If delivery and/or return air is to be ducted to a remote location, remove the evaporator air intake and discharge grilles from the unit. Install ductwork as required, and install grilles on the outer ends of the ducts. Be sure to incorporate provisions for access to air filter and mist eliminator in the ductwork.

i. If the control panel is to be remotely located, remove it from the air conditioner as directed in the following steps:

- (1) Disconnect power source from unit.
- (2) Remove the front access panel and the evaporator intake grille from the air conditioner to provide access (figure 1-1).
- (3) Disconnect the wiring harness connector from the receptacle on the left end of the control panel as-

sembly (figure 4-2).

(4) Remove the four screws from the control panel assembly to the junction box.

(5) Remove the air filter.

(6) Loosen the loop clamp on the evaporator temperature control thermostat sensor. Turn the thermostat sensor to the left-hand side of the evaporator fan housing. Carefully thread the capillary tube carefully through the fan housing, removing the control panel from the unit. Coil the capillary tube carefully around the thermostat bulb in the outside cavity of the fan housing, using the loop clamp to secure the connection.

(7) Install a block-off assembly in the same position as the control panel assembly was removed. Retain the four screws retained in step (4).

(8) Mount the control panel at the desired remote location, and secure it with the MS3106R-28-11S, in the same position as either the block-off plate or the evaporator intake louver and discharge grille.

(9) Locally manufacture a remote control panel enough to reach from the remote location to the air conditioner. (See Figure FO-1).

NOTES

The power supply cable to a position next to the cable, if desired.

(10) Replace filter, grill, and condenser, and plug in power supply cable.

Panel 2, remove maintenance of grilles, and must be removed for access. Panels and

the air conditioner for an annual checkup and an operating check of the controls.

Table 4-1. Organizational Preventive Maintenance Checks and Services — Quarterly Schedule

Item to be Inspected	Procedures	Equipment will be reported not ready/available if:
Grilles and louvers	Check for bent or damaged louver blades and frames. Check freedom of operation. Straighten bent blades or frame by hand, if possible. To remove grilles for repair or replacement, turn six cam-lock studs a quarter-turn clockwise. Apply light machine oil to pivots of louver blades to restore freedom of operation, if necessary. Blot up excess oil with cloth or paper towel.	Louver blades bent beyond repair, or missing. Frame deformed, torn or broken.
Air Filter	Clean and service, or replace if perforated, torn or otherwise damaged. Clean filter by agitating in detergent solution or dry cleaning solvent (Fed Spec P-D-680). Shake or blow dry.	Filter is perforated (1/4-inch hole or larger) through entire thickness, or frame is bent or damaged beyond repair.
<div>WARNING</div> <p>Disconnect power from the air conditioner before exposing the electrical system. The voltage used can be lethal.</p>		
Mist Eliminator	Remove 18 screws and washers from top panel, and remove top panel. Slide mist eliminator up out of channels. Clean by agitating in detergent solution and rinsing in clear water. Inspect for punctures, tears or deformation. Replace if damaged. Install in channels in front of evaporator coil, making sure that TOP mark is up, and that airflow arrows point outward.	Mist eliminator is missing or damaged.

by agitating it in detergent solution or dry cleaning solvent (Fed Spec P-D-680). Blow dry with compressed air. Replace if the wire mesh is cut or broken. Re-align wires if displaced.

5*	Condenser coil guard.	Inspect for damage. Replace if rods are cut, broken or displaced, or if screen is damaged. To remove, unscrew eight screws and washers, and four lockwashers from top and bottom edges. Clean by agitating in dry cleaning solvent (Fed Spec P-D-680). Blow dry.	Guard is broken or screen is perforated.
6	Rear Cover	Clean with detergent solution. Inspect for tears, punctures and damaged slide fasteners. Repair or replace damaged cover. Lubricate slide fastener, if necessary, with wax stick (candle or crayon) or spray lubricant.	Rear cover is torn, slide fastener is broken, or cover is irreparably damaged.
7	Condenser fan guard	Check for deformation, tears or broken mesh. Replace if necessary. Clean by agitating in detergent solution.	Broken or deformed mesh is not repairable.

NOTE

Condenser fan guard is designed so that bolt holes match in only one position. Do not force or re-drill holes to fit.

8	Controls	Connect power to air conditioner. Check controls for proper operation, looseness or damage. Tighten or replace as necessary.	Controls are damaged or do not operate properly.
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Service monthly or oftener when required by operation in extremely dusty or sandy environments.

ch malfunction for an individual component, unit system is followed by a list of tests or inspections which will help you to determine corrective actions to take. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions. If a malfunction is not listed, or is not cor-

the air conditioner or its components. You should perform the tests/inspections and corrective actions in the order listed.

NOTE

Before you use this Table, be sure you have performed all applicable operating checks.

Table 4.2. Troubleshooting

MAJOR MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

AIR CONDITIONER FAILS TO OPERATE

- Step 1.** Check to be sure that main power cable is connected.
Connect cable.
- Step 2.** Check mode selector switch for correct setting.
Turn selector switch to COOL.
- Step 3.** Verify that circuit breaker has not tripped.
Pull then push the circuit breaker reset knob.
- Step 4.** Make sure that you are using 208-volt, 50/60 cycle, 3-phase current.
Check each phase of supply line with voltmeter.
- Step 5.** Inspect main power receptacle connector for breakage.
Replace broken connector.
- Step 6.** Check for loose electrical connections.
Tighten connections.
- Step 7.** Verify that high- and low-pressure cutout switches have not opened.
Press and release reset buttons on high- and low-pressure cutout switches.

WARNING

Disconnect power from the air conditioner before doing maintenance work on the electrical system. The voltage used can be lethal.

- Step 8.** Check continuity of fuses XF1 and XF2.
Replace bad fuses.
- Step 9.** Check transformer: 208-volt primary, 30-volt secondary.
Replace bad transformer.
- Step 10.** Check rectifier assembly by applying 30 ± 3 -volt ac to input terminals, and observing voltmeter at output (+) and (-) terminals. Voltmeter should read 24-28 volts, dc.
Replace bad rectifier assembly.

INSUFFICIENT COOLING

- Step 1.** Check evaporator intake and outlet louvers to be sure they are open and not obstructed.
Open louvers or remove obstruction.
- Step 2.** Make sure that mode selector switch is positioned properly.
Set switch at COOL.
- Step 3.** Verify that temperature selector switch is properly set.
Set switch at maximum DECREASE.
- Step 4.** Make sure that condenser intake screen is not clogged or obstructed.
Clean intake screen.

- Step 5.** Remove evaporator intake grille, remove air filter and inspect for dirt or clogging of any kind.
Clean filter.
- Step 6.** Inspect condenser coil for dirt or obstruction.
Clean coil with vacuum cleaner and brush attachment, or use 30 psi compressed air inside of coil to blow out dirt, keeping air nozzle at least eight inches from coil.
- Step 7.** Check sight glass liquid indicator for bubbles. If bubbles exist check system for leaks.
Repair leaks, and recharge system.
- Step 8.** Feel drier-strainer (dehydrator) to see whether it is cold to the touch, or is frosted or sweating. Cold charge indicates obstruction.
Discharge system over a period of 5-6 hours to prevent oil being blown out of system, replace drier-strainer.
- Step 9.** Check inlet and discharge sides of solenoid valves for temperature difference. Abnormally cold discharge indicates leakage or obstruction.
Repair or replace faulty solenoid valve.
- Step 10.** Check evaporator coil for over-all temperature. If part of coil is relatively warm, and evaporator refrigerant inlet is sweaty or frosty, expansion valve may be damaged or obstructed.
Replace faulty expansion valve.

3. FAN MOTOR DOES NOT OPERATE

- Step 1.** Make sure that power cable is properly connected and that 3-phase power is supplied.
Connect cable.

WARNING

Disconnect power from the air conditioner before doing maintenance work on electrical system. The voltage used can be lethal.

- Step 2.** Check connectors P3 and P9 for proper tightness.
Tighten as necessary and retry starting.
- Step 3.** Check continuity of fuses XF1 and XF2.
Replace bad fuses.
- Step 4.** Remove lower panel, junction box cover, and control panel. Tag wires to mode selector switch for identification, and disconnect wires from switch. Using an ohmmeter or continuity tester, check continuity in each position in accordance with the following switch-position tabulation:

SELECTOR SWITCH - S1 - POSITION	SWITCH FUNCTION	SWITCH WAFERS AND TERMINALS CONNECTED			
		S1A	S1B	S1C	S1D
1	HEAT (HIGH)	12 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C 32 AND 3A	41 AND 4C 42 AND 4A
2	HEAT (LOW)	12 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C	_____
3	OFF	_____	_____	_____	_____
4	VENT	_____	21 AND 2C 22 AND 2B	31 AND 3C	_____
5	COOL	12 AND 1B 11 AND 1R	21 AND 2C 22 AND 2R	31 AND 3C 32 AND 3R	41 AND 4C 42 AND 4R

Replace faulty mode selector switch.

- Step 5. Check continuity of electrical leads from relay (K5) terminals A2, B2, C2 and D2 to fan motor connector P9, terminals D, E, H and G. If continuity is not shown in one or more leads, check from relay (K5) terminals A2, B2, C2 and D2 to connector J3, terminals h, S, T and P to connector P9, terminals D, E, and G. If continuity is shown in all these leads, motor is bad.

Replace open wire leads, or replace motor.

EVAPORATOR AIR OUTPUT VOLUME LOW

- Step 1. Inspect filters for dirt and clogging.
Clean and replace filters.
- Step 2. Inspect mist eliminator for dirt and clogging.
Clean and replace mist eliminator.
- Step 3. Check evaporator blower impeller for looseness, binding or damage.
Tighten setscrews or relieve binding as necessary, or replace damaged impeller.

WARNING

Disconnect power from the air conditioner before doing maintenance work on electrical system. The voltage can be lethal.

- Step 4. Check wiring connections to fan motor, relay K5, and connector plugs for looseness.
Tighten loose connections.

EXCESSIVELY NOISY OPERATION

CAUTION

If knocking or hammering is heard when air conditioner is started up, shut down once and report the condition to direct support maintenance. The compressor may be pumping liquid refrigerant, which will cause severe damage.

- Step 1. Listen for knocking or hammering sounds. Install gauge set, and check for high discharge pressure.
Bleed off some refrigerant.
- Step 2. Check evaporator and condenser fan impellers for looseness, vibration or interference.
Tighten setscrews. Check impellers for damage which would cause out-of-balance condition, and replace impeller and guard, shroud, etc.
- Step 3. Check fan and blower motor for wear, as indicated by noisy operation or excessive end- or side-play.
Replace bearings, or motor.

COMPRESSOR WILL NOT START

- Step 1. Check continuity of circuit breaker. Unscrew four panel fastener screws, and remove front access from air conditioner. Unscrew four panel fastener screws, and remove junction box cover. Tag and disconnect leads from circuit breaker, and check continuity of each pair of terminals, using an ohmmeter or continuity tester.
Replace circuit breaker if bad.
- Step 2. Check continuity of fuses.

NOTE

If a fuse indicates no continuity it may have blown because of a short circuit or overload in the transformer or one of the other components. Using an ohmmeter or continuity tester, remove fuses from fuse blocks and check continuity. Replace fuses that show continuity, and proceed to Step 3.

- Step 3. Check condition of high- and low-pressure cutout switches by pressing reset buttons.
Replace faulty pressure cutout switches.

Disconnect power from the air conditioner before doing any maintenance work on the electrical system. The voltage used can be lethal.

- Step 4.** Check for loose electrical connections or faulty wiring.
Tighten loose connections. Replace bad wiring.
- Step 5.** With lower panel and junction box cover removed, disconnect transformer leads from fuse block, XF1, terminals 2 and 3. Also disconnect transformer secondary leads from rectifier CR1, terminals 1 and 4. Apply 208 volts, ac, to input leads which were disconnected from fuse block. Check voltage at secondary leads to be sure it is 28-30 volts ac.
Replace faulty transformer.
- Step 6.** With lower panel and junction box cover off, disconnect rectifier leads from fuse block XF2, terminal 1 and from terminal block TB2, terminal 6. Apply power to transformer to obtain 27-30 volts ac to rectifier and check disconnected leads to be sure that 24-28 volts dc is indicated. Positive (+) terminal is at XF2, terminal 1; negative (-) terminal is at TB2, terminal 6.
Replace faulty rectifier.
- Step 7.** With lower panel and junction box cover off, tag wires at K1 for identification, and disconnect. Apply 24-28 volts dc to terminals X1 and X2 of relay K1, and check continuity of pairs A1-A2, B1-B2 and C1-C2. Each pair should indicate continuity.
Replace faulty relay.
- Step 8.** Disconnect transformer leads, and check continuity of H1-H2, X1-X2, H1-X1, H2-X2 and each lead to transformer casing or common ground. H1-H2 and X1-X2 should show continuity; others should not show continuity.
Replace transformer if continuity requirements are not met.
- Step 9.** Disconnect leads of rectifier. Apply 28-30 volts ac to leads 1-4, and check leads 2-3 for 24-28 volt dc output.
Replace bad rectifier.
- Step 10.** Disconnect compressor relay, K1. Apply 24-28 volts dc to terminals X1-X2, and check continuity of terminals A1-A2, B1-B2, C1-C2. All should indicate continuity.
Replace faulty compressor start relay, K1.
- Step 11.** With lower panel and junction box cover off, tag wires to time delay relay, K3, for identification and disconnect. Apply 28 volts, dc, to primary terminals: positive (+) to terminal 1, and negative (-) to terminal 2. Check continuity across secondary terminals 3 and 4 to see that contact is made within 25 ± 6 seconds energizing.
Replace bad time delay relay.
- Step 12.** Disconnect plug, P4, from compressor receptacle. Using an ohmmeter or continuity tester, test receptacle points A-B, A-C, B-C, and D-E. Continuity should be indicated. Test points A, B and C to compressor casing or common ground. No continuity should be indicated.
Replace compressor that does not meet continuity requirements.

COMPRESSOR STARTS BUT STOPS AT ONCE — "SHORT CYCLES"

- Step 1.** Check sight-glass liquid indicator for bubbles while compressor is operating. If bubbles appear, check refrigeration system for leaks.
Repair leaks, and add refrigerant until sight-glass is clear when compressor is running.
- Step 2.** Connect pressure gauges to suction and discharge service valves. Check system pressures as indicated in the following Table:

Temperature	10°C	24°C	38°C	49.5°C	70°C
Gauge Pressures					
Suction (psig)	56-60	56-65	65-75	70-80	75-80
(Kg/Cm ²)	3.93-4.22	3.93-4.57	4.57-5.27	4.92-5.62	5.27-5.92
Discharge (psig)	135-155	185-205	275-295	375-380	400-410
(Kg/Cm ²)	9.50-10.90	13.00-14.41	19.33-20.74	26.36-26.72	28.12-28.53

80°F (27°C) dry bulb return air to unit

Indoor ambient temperature	50°F 10°C	75°F 24°C	100°F 38°C	125°F 52°C	150°F 66°C
Gauge Pressures					
Suction (psig)	56 min.	56 min.	56-65	65-75	75-80
(Kg/Cm ²)	3.93 "	3.93 "	3.93-4.57	4.57-5.27	5.27-5.92
Discharge (psig)	130-150	180-200	270-290	290-410	410-430
(Kg/Cm ²)	9.14-10.55	12.65-14.06	18.98-20.39	20.39-28.82	28.82-30.23

NOTE: Dry bulb temperatures are measured with an ordinary thermometer

Table 4-2. Troubleshooting - (Cont.)

REFRIGERANT MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

If pressures are too low, check for leaks and add refrigerant; if too high, bleed off refrigerant until normal.

- Step 3.** If pressures are normal, turn off power, and short-circuit high- or low-pressure cutout switch. power for maximum of 12 seconds, and see whether compressor operates normally.

CAUTION

Do not exceed 12-second operating time, or vacuum may be formed in suction refrigeration system and damage compressor.

Bleed off refrigerant over a period of 5-6 hours to prevent oil being blown out of system, then replace pressure cutout switch and recharge system.

COMPRESSOR STARTS, BUT GOES OFF ON OVERLOAD.

- Step 1.** Check condenser intake screen for obstructions.
Clean screen or remove obstructions.
- Step 2.** Check condenser coil for dirt or obstruction.
Clean coil with vacuum cleaner, or remove obstruction.
- Step 3.** Visually check to be sure that condenser fan is operating properly.
Tighten setscrews on loose impeller. Replace bad motor.

COMPRESSOR RUNS BUT DOES NOT COOL

- Step 1.** Check sight-glass liquid indicator for bubbles indicating low charge of refrigerant. If bubbles are present, check refrigeration system for leaks.

Discharge system over a period of 5-6 hours to prevent oil being blown out repair leaks or replace leaking component.

- Step 2.* Remove evaporator air discharge grille and check for evaporator coil icing. If icing is present, bypass pressure regulating valve setting (suction pressure).

CAUTION

Do not use steam, open flame, heat gun or any other high-temperature heat source to thaw an iced evaporator coil.

Thaw an iced coil with a lamp bulb (75-watt maximum), hair dryer or electric heat gun, just pressure regulating valve.

- Step 3.* Check compressor fan for noisy operation, high suction pressure, or excessively low discharge pressure indicating leaky internal valves.

10. SUCTION PRESSURE TOO LOW OR TOO HIGH

- Step 1.* Stop Compressor and check thermostatic expansion valve as follows:
- Remove insulating compound from remote bulb, and remove bulb from remote bulb.
 - Place bulb in ice water for 1-2 minutes.
 - Start compressor.

CAUTION

Do not let liquid flood back into compressor for more than 2-3 seconds. Compressor will be seriously damaged.

d. Remove bulb from ice water and hold it in one hand to warm it. At the same time, feel the suction line for a rapid change of temperature, or a flood-through of liquid refrigerant. If liquid floods through valve, it is open too far. If not, valve or remote bulb is faulty.

Discharge refrigerant from system over a period of 5-6 hours to prevent blowing out the system. Replace faulty expansion valve and filter-drier. Purge with dry nitrogen and recharge.

- Step 2.* Feel filter-drier for temperature difference. Discharge end will feel cooler than input end. Charge end may be sweaty or frosty.

Discharge refrigeration system over a period of 5-6 hours to prevent blowing out the system. Replace filter-drier, purge with dry nitrogen, and recharge.

11. UNIT FAILS TO HEAT

- Step 1.* Check mode selector switch for incorrect setting.
Set selector switch to LO HEAT and HI HEAT.
- Step 2.* Make sure that temperature control thermostat is set properly.
Set switch at INCREASE.
- Step 3.* Inspect for dirty or obstructed air filter.
Clean filter.
- Step 4.* Remove top, and check for dirty or obstructed mist eliminator.
Clean or replace mist eliminator.

WARNING

Disconnect power from the air conditioner before doing maintenance on the system. The voltage used can be lethal.

- Step 5.** With top cover removed, check electrical connections to heating element and thermostat, and visually check elements for damage.
- Tighten loose connections. Replace damaged elements.**
- Step 6.** Disconnect each element in turn, and check continuity. Also check continuity of thermostat point to point. Continuity should exist when temperature is below 142°F (61°C).
- Replace faulty heating element or thermostat.**
- Step 7.** Remove front panel and junction box cover. Tag wires to relay K2 for identification, and disconnect. Apply 28 volts dc to terminals X1 and X2 on relay K2, and check continuity of pairs A1-A2, B1-B2 and C1-C2. Continuity should exist in each pair. Check continuity of each terminal to ground. Continuity should not exist.
- Replace bad relay.**

Section V. MAINTENANCE PROCEDURES

Fabric Cover (See figure 4-4).

Description. The fabric cover is made of vinyl imitated nylon and is supported on a framework of aluminum rod around all four sides. The cover assembly is mounted on the air conditioner casing by 18 screws and washers through eyelets in the fabric. Two turnbuttons are incorporated in the top edge of the cover, and the cover is equipped with eyelets for holding the rolled-up cover by means of turnbutton fasteners. The cover is fastened in the closed position by means of a heavy-duty slide fastener.

Removal. Remove the fabric cover as follows:

- 1) Roll the cover down, and fasten all around with the slide fastener.
- 2) Remove 18 screws and washers from the four corners of the cover.
- 3) Slide the cover off the air conditioner by pulling and pushing on the aluminum frame near the corners. If the cover is stuck to the casing with dried mud or other debris, carefully insert a putty knife, paint scraper or similar blade between the cover and the casing to separate them. If difficulty is still encountered, place a clean wood block near each corner in the casing and drive the cover off with a light hammer.

Cleaning. Clean the fabric cover and the portion of the casing from which it was removed, using a detergent solution and viscose sponge or cloth. Use a scrubbing brush if necessary to remove caked-on dirt. Rinse with clear water, and air dry.

Inspection/Repair. Inspect the fabric cover for tears, cuts, punctures in the fabric, and for missing or damaged parts of the slide fastener. Repair

punctures and minor cuts, rips or tears up to 3 inches or 7.5 cm long by patching the inside surface. In case of damage of greater extent, or missing parts of the slide fastener, replace the cover.

e. Lubrication. Lubricate the slide and the locking fingers of the slide fastener with a wax crayon (crayon or candle) or spray lubricant. Operate the slide several times in each direction to distribute the lubricant.

f. Installation. With the flap closed and fastened, place the fabric cover on the air conditioner with the two tapes at the top, inside. Press the aluminum frame-work around all four edges to seat the cover in the casing. When the eyelets in the cover are aligned with the screw holes in the casing, install 18 screws and washers to secure the cover.

4-8. Top Panel Assembly (See figure 4-4).

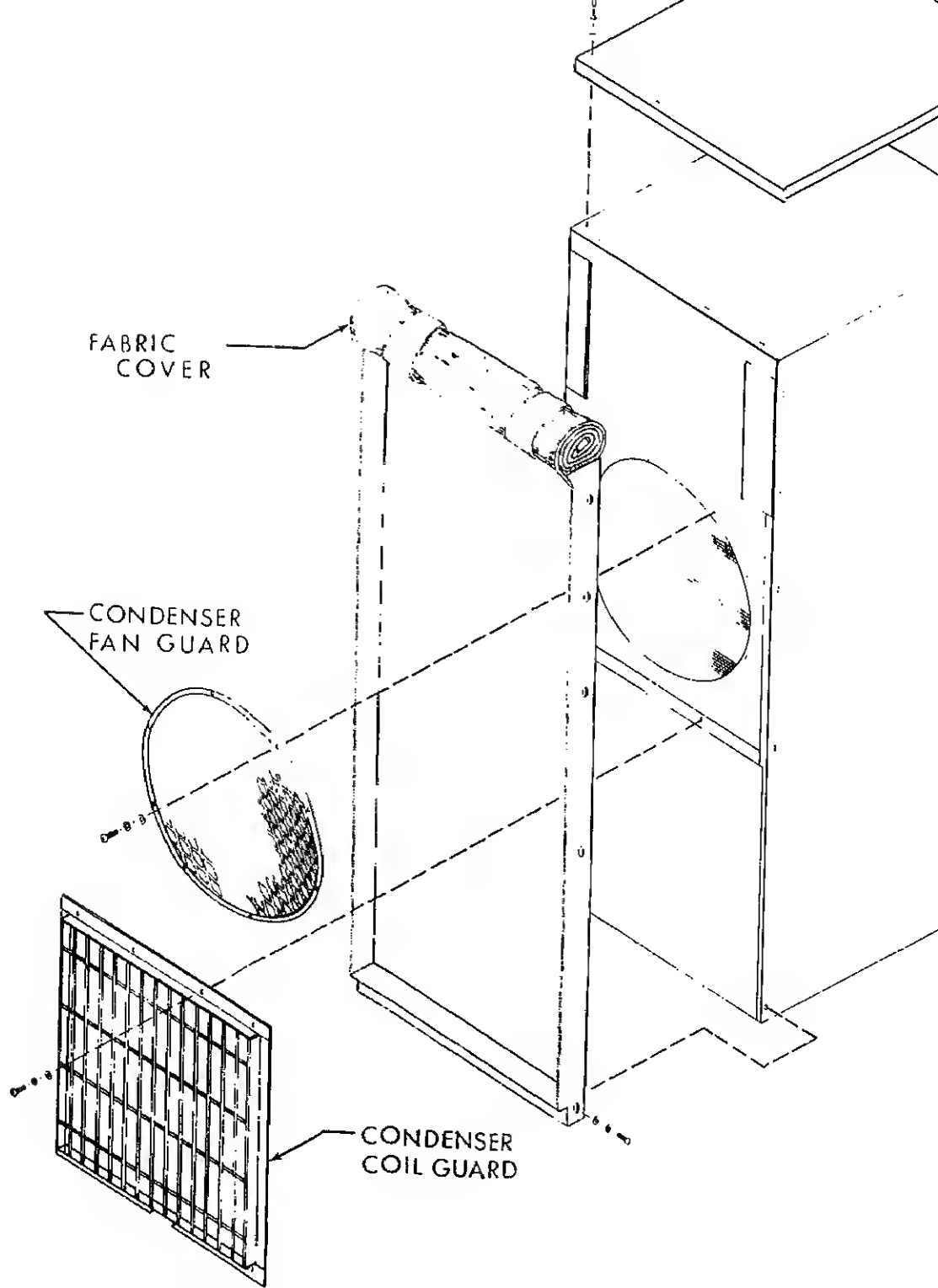
a. Description. The top panel is a flat aluminum plate which encloses the top of the air conditioner. Mating edges are equipped with radio frequency interference (RFI) gaskets, and other areas are insulated to minimize heat gain/loss and sound transmission. Internally threaded rivets are incorporated in the rear edge of the top panel to support the upper portion of the fabric cover.

b. Removal. With the fabric cover removed, as constructed above, remove five screws from the top flange of the top panel. Remove 15 screws and washers from the top surface of the panel. Remove

FABRIC
COVER

CONDENSER
FAN GUARD

CONDENSER
COIL GUARD



excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).

cleaning. Clean the outside surface of the top with a cloth dampened with detergent solution or cleaning solvent (Fed Spec P-D-680). Clean the insulated surface with a dry dusting brush or a foam cleaner with a brush attachment. Clean the edges of the gaskets with a cloth moistened in dry cleaning solvent (Fed Spec P-D-680).

Inspection/Repair. Inspect the top panel for cracks, nicks, gouges or deformation. Inspect interior for torn, loose or missing insulation and repair material. Repair dents, nicks, gouges or deformation, using conventional sheet-metal repair methods. Replace damaged gaskets or insulation in the following manner:

(1) Remove as much old insulation or gasket as possible by pulling it off or scraping it away from the surface.

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapor can be toxic. Use in a well ventilated area, wear gloves, and keep away from sparks or flame.

(2) Soften and remove old adhesive and the residue of insulation or gaskets, using acetone or MEK and a stiff brush.

(3) Coat the mating surfaces of the metal and the insulation/gasketing material with adhesive. Let both surfaces air dry until the adhesive is tacky but will not stick to the finger.

(4) Starting with an edge or corner, carefully attach the insulation/gasket to the metal. Press into contact all over.

Installation. Position the top panel on the air conditioner, and secure with 15 screws and packing washers through the top surface, and five screws through the rear flange. Install the fabric cover, and secure with 18 screws and washers.

Air Intake and Discharge Grilles (See Figure 4-5).

Description. The evaporator air intake grille is

screen when the damper is open. The evaporator discharge grille is equipped with two sets of independently mounted vanes. The horizontal vanes are positioned to direct the air upward or downward. The vertical vanes can be positioned to direct the air to one or both sides of the center.

b. Removal. Both evaporator grilles are retained in the casing in the same way; with three cam fasteners in each side. Remove each grille by pulling the cam-lock studs counter-clockwise, and pulling the grille outward.

WARNING

Dry cleaning solvent (Fed. Spec P-D-680) used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).

c. Cleaning. Clean the grilles by agitating in detergent solution or dry cleaning solvent (Fed Spec P-D-680). Use a soft brush if necessary to clean caked-on dirt.

d. Inspection/Repair. Inspect grilles for bent blades, deformed frames, or damaged blade-to-frame operating linkage. Repair deformation by hand if possible. Replace grilles if blades are broken or damaged beyond repair. Inspect material for hardening, permanent set, and cut or missing pieces. Replace gaskets as directed in the following procedure:

(1) Remove as much old gasket material as possible by pulling or scraping it away from the surface.

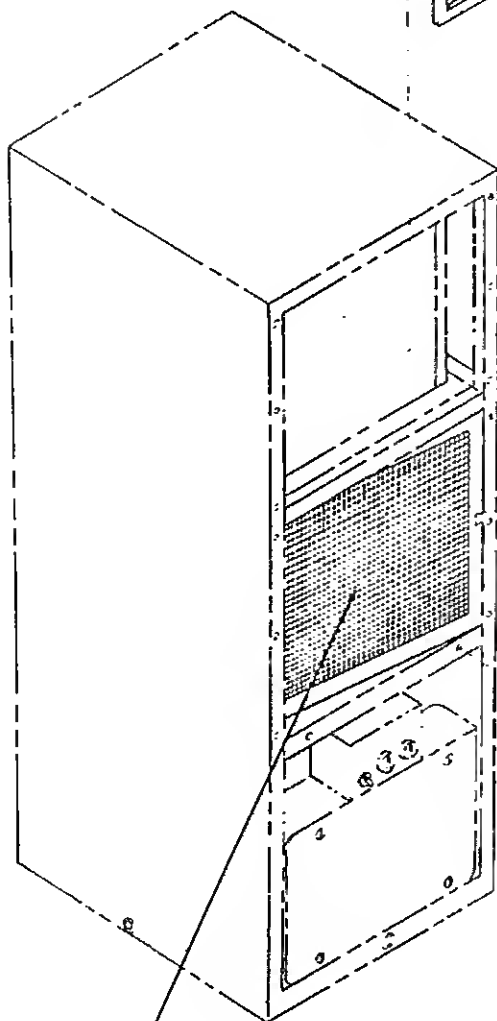
WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and the vapors can be explosive. Repeated prolonged skin contact or inhalation of vapors can be toxic. Use in a well ventilated area, wear gloves, and keep away from sparks or flame.

(2) Soften and remove old adhesive and residue, using acetone or MEK and a stiff brush.

(3) Coat the mating surfaces of the metal and gasket with adhesive. Let both surfaces air dry until the adhesive is tacky but will not stick to the

MIST
ELIMINATOR



AIR FILTER

LOWER PANEL

ation. Position the grilles on the front of the conditioner. Turn the cam-lock stud fasteners to engage them.

Lower Panel (See figure 4-5).

Operation. The lower panel encloses and seals the front area of the air conditioner. It contains a cutout opening to provide access to the panel. The opening is sealed with an RFI-gasket.

Disassembly. Remove the lower panel by unscrewing the fastener screws in the upper edge, and pull the panel outward and upward.

Assembly. The lower panel assembly consists of the panel itself, strips of wire-mesh-covered RFI gasket material, a refrigeration flow direction information plate riveted to the inner surface of the panel, a strip of foam insulation, a strip of gasket material along the bottom edge, and two panel fastener screws in the top edge. Disassemble as required only to the extent necessary to effect

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors can be explosive. Repeated or prolonged skin contact or inhalation of vapors can be toxic. Use in a well ventilated area, wear gloves, and keep away from sparks or flame.

Remove gasket material by inserting a putty knife between the gasket and the panel. Scrape and remove adhesive residue with MEK and a stiff brush.

Remove rivets, and remove information

Remove retaining washers from panel fastener screws by cutting and bending, or support the panel firmly with the head of the panel fastener screw over a hole at least as deep as the screw and driving the screw out from the inner

or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).

d. Cleaning. Clean the lower panel with a cloth dampened in dry cleaning solvent (Fed Spec D-680).

e. Inspection. Inspect the panel for dents, gouges, cuts or openings through which air could enter the casing. Inspect gaskets for looseness or missing sections.

f. Repair. Repair the lower panel, using conventional sheet metal repair methods, as required, if damage does not exceed minor dents or perforation. Replace the panel if major damage exists.

g. Assembly. Assemble the lower panel as directed in the following steps:

(1) Insert panel fastener screws through the holes in the upper edge of the panel, from the outside. Place retaining washers over the threaded portions of the screws from inside the panel. Lay the panel on a firm, flat surface, and stake the ID of the retaining washers flat around the shanks of the screws.

(2) Install the information plate on the inside of the lower panel, using blind rivets through the matching holes.

CAUTION

There must be metal-to-metal contact between vertical and horizontal sections of the RFI gasket material surrounding the control panel opening.

(3) Cut five pieces of RFI gasket to length, as follows:

(a) Cut two pieces to the height of the control panel opening.

(b) Cut two pieces to the width of the control panel opening plus the additional thickness of the two pieces cut previously.

(c) Cut one piece to the length of the bottom flange (offset) of the lower panel.

(4) Apply a coating of RFI adhesive to the mating surfaces of both the metal panel and the gasket material. Let both surfaces air-dry until they are tacky but will not stick to the fingers. Carefully press each piece into firm contact with the panel.

fastener screws engage the sheet spring nuts on casing. Tighten the screws.

3. CBR Cover (See figure 1-1).

Description. The chemical-biological-radioactive (CBR) air filter connection to the air conditioner is located in the upper left corner of the rear face of the air conditioner. When CBR equipment is not connected, the opening is closed by a sheet-metal cover, (figure 1-1).

Removal. Remove five screws from the rim of the CBR cover, and remove the cover.

Inspection. Inspect the CBR cover for obvious damage. Repair if damage is minor. Replace if necessary.

Installation. Position the CBR cover on the air conditioner, and secure with five screws.

4. Fresh Air Screen (See figure 1-1).

Description. The fresh air screen is mounted on the upper right corner of the rear surface of the air conditioner. It encloses the two refrigeration service valves, and screens out leaves and other debris from fresh air intake when the fresh air damper is open.

Removal. Remove five screws from the rim of the fresh air screen, and remove the screen.

Inspection. Inspect the screen for broken or dislodged wires or other damage. Replace the screen if damage is evident.

Installation. Position the fresh air screen on the air conditioner, and secure with five screws.

5. Condenser Coil Guard (See figure 4-4).

Description. The condenser coil guard occupies the bottom one-third of the rear surface of the air conditioner. It is aluminum fabrication, consisting of a grid of 3/16-inch aluminum rods in a frame of aluminum angle. The face of the guard is covered with 1/2-inch mesh aluminum wire cloth to prevent the entry of leaves and other small debris. The guard is secured to the casing of the air conditioner with screws and washers.

Removal. Remove four screws and flat washers from the top of the condenser coil guard frame, and remove four screws, flat washers and lockwashers from the bottom of the frame. Pull the guard outward to remove.

Cleaning. Brush or blow loose dirt from the surface of the screen, then agitate the condenser coil guard in detergent solution or dry cleaning solvent

able. Replace guard if rods or frame are bent beyond the limits of simple repair.

Installation. Position the condenser coil guard on the air conditioner, with the semicircular drain cutout and the oval screw holes at the bottom. Secure with four screws and flat washers through the top of the frame, and four screws, flat washers and lockwashers through the bottom of the frame.

4-14. Condenser Fan Guard (See figure 4-4).

Description. The condenser fan guard is mounted near the middle of the rear surface of the air conditioner. The guard is fabricated from heavy-weight expanded metal mesh mounted in a circular sheet-metal frame. The attaching screw holes in the frame are purposely arranged in an unsymmetrical pattern, so the fan guard can be installed in only one way. Installation is necessary to orient the angle of the expanded metal so that hot exhaust air will be directed upward, away from the condenser coil intake.

Removal. Remove eight screws and lockwashers from the frame of the fan guard, and remove the guard.

WARNING

Dry cleaning solvent (Fed. Spec P.D-080) used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).

Cleaning. Agitate the fan guard in detergent solution or dry cleaning solvent (Fed Spec P.D-680), and blow dry.

Inspection/Repair. Inspect for broken, bent, or deformed metal, and for broken tack-welds between frame and screen. Straighten minor deformations, being careful to avoid flattening the screen. Replace the guard if broken or cut.

Installation. Position the condenser fan guard on the air conditioner so that all screw holes are aligned. Secure with eight screws and lockwashers.

4-15. Back Panel and Motor Support (See figure 4-6).

Description. The two-speed fan motor support is a welded fabrication of tubing and formed sheet metal which supports the rear end of the motor. It is attached to the back of the air conditioner.

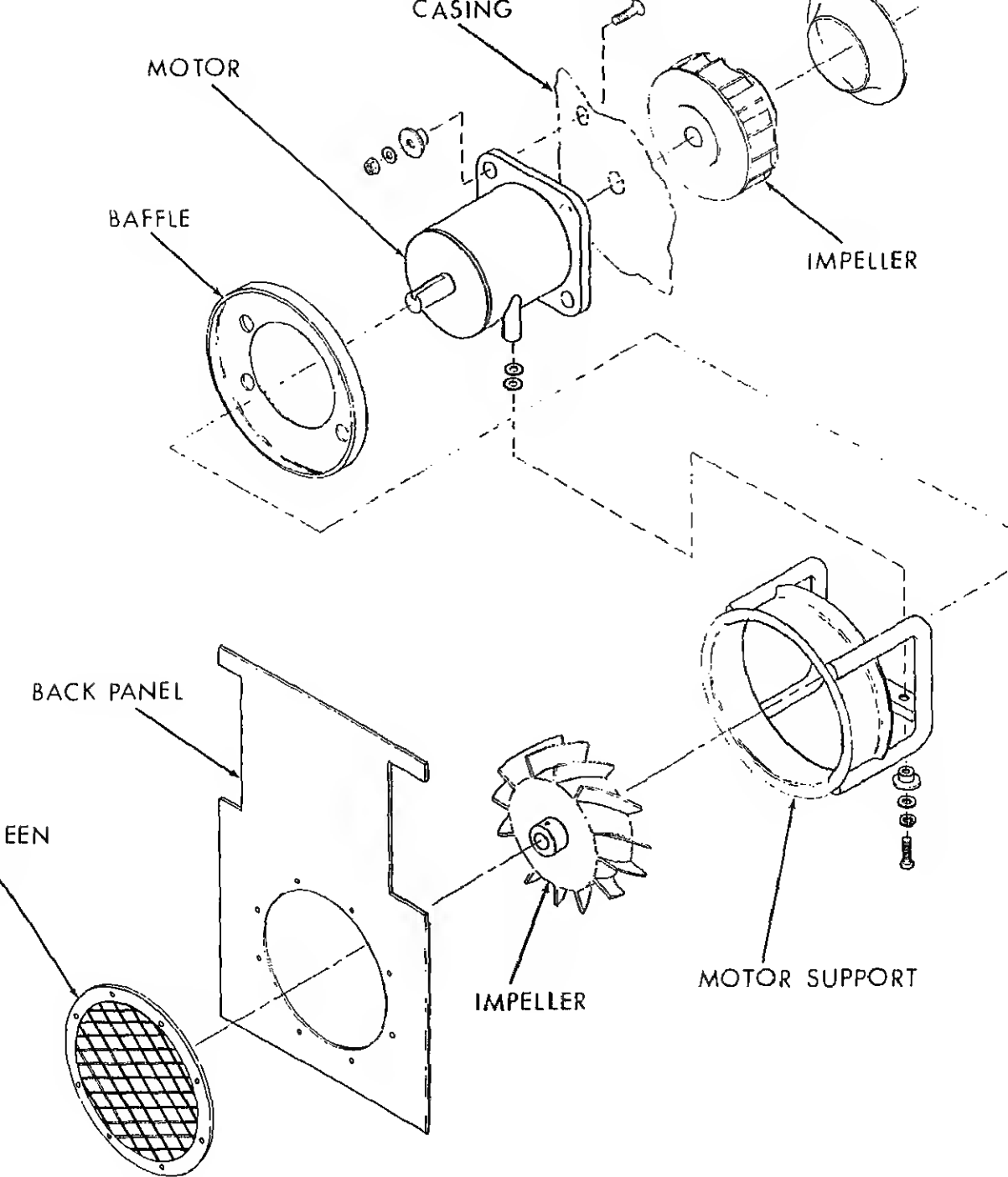


Figure 4-6. Back Panel and Motor Support.

assembly from the air conditioner as directed in following procedure:

- (1) With the fabric cover closed, remove 18 screws and washers from the four edges, and remove the fabric cover.
- (2) Remove five screws from the rear flange of the back panel, and 15 screws and packing washers from the top. Remove the top panel.
- (3) Remove four screws and washers from the top of the condenser coil guard. It is not necessary to remove the guard.
- (4) Remove five screws from the fresh air screen, and remove the screen.
- (5) Remove five screws from the CBR cover, and remove the cover.
- (6) Remove two screws and lockwashers from each side of the sight-glass liquid indicator. Hold the bracket inside the casing while removing the second screw, to prevent loss of the bracket.
- (7) Remove two screws from each end of the pressure cutout switch housing. Be careful to avoid kinking capillary tubes.
- (8) Remove the four screws, lockwashers and nuts from the corners of the power input receptacle.
- (9) Pull knob of circuit breaker reset flexible cable all the way out (about 2-1/2 inches). Grip the shaft firmly with copper-jawed pliers, and unscrew the knob. Remove panel mounting nut and lockwasher from ferrule of cable assembly, so that cable is free of panel.
- (10) Remove eight screws and lockwashers from the rim of the condenser fan guard. Remove the guard.
- (11) Loosen the two setscrews in the hub of the condenser fan impeller, and remove the impeller from the motor shaft. Use two 1/4-20 jackscrews in the threaded holes in the hub if necessary to remove the impeller.
- (12) Unscrew but do not remove four screws which attach the baffle to the motor mount assembly. Remove the baffle carefully to avoid losing spacers and screws.
- (13) Carefully remove two socket-head cap screws, lockwashers, flat washers and bushings which secure the motor mounting feet to the cross-bar of the mounting assembly.
- (14) Drill out 23 rivets in the sides of the back panel and remove the back panel and motor mount assembly from the air conditioner.

Remove information and data plates by pulling out rivets at the corners or ends of the plates.

d. Inspection. Inspect the back panel for dents, rust or perforations, and for deformation. Inspect the motor mount assembly for deformation or broken welds. Replace parts exhibiting major damage.

e. Repair. Repair dented or bent panel, using conventional sheet-metal repair methods. Repair broken welds in motor mount assembly if no misalignment will result.

f. Assembly. Assemble the back panel and motor mount assembly as indicated in the following steps:

(1) Position information and data plates at proper locations, and secure with blind rivets.

(2) Clamp the flange of the motor mount assembly against the inner surface of the back panel, using two or more drift pins, or equivalent, to align the holes. Install eight internally threaded blind rivets from the outside surface.

g. Installation. Install the back panel and motor mount assembly on the air conditioner in accordance with the following procedure:

(1) Wire or tie the assembly in its approximate position on the back of the air conditioner, so that the back panel hangs from its top to permit it to swing out far enough to allow room to work inside.

(2) Position the pressure cutout switch housing against the inside of the panel, and secure with two screws in each end.

(3) Place the spacer over the window side of the sight-glass liquid indicator, and the mounting bracket over the back of the indicator. Work the hole in the back panel into position over the sight-glass, and install the two screws and lockwashers into the bracket, and tighten.

(4) Install the power supply receptacle in the lower right-hand corner of the back panel. Secure with four screws, lockwashers and nuts.

(5) Install the ferrule of the circuit breaker reset cable assembly through the hole in the lower right-hand corner of the back panel. Secure with a panel mounting nut. Grip shaft in the pressure strip held in pliers, and screw on knob firmly.

(6) Align holes in back panel with holes in the casing, using at least two drift pins or the equivalent. Cut temporary attaching wire or cord, and secure the panel to casing with 23 blind rivets.

(7) Tighten screws in sight-glass liquid indicator.

of back panel, and secure with five screws.
(10) Position the CBR cover on the upper left corner of the back panel, and secure with five screws.
(11) Loosen four nuts attaching the fan motor to the partition if necessary to insert washer between mounting feet of motor and motor mounting assembly. Assemble mounting hardware as shown in figures 4-7. Select proper thickness of resilient washer. Tighten four nuts on motor flange when mounting is complete.

CAUTION

Do not hammer impeller onto motor shaft; motor bearings would be damaged. Dress out roughness with a fine file, stone or abrasive cloth. Apply a coating of light machine oil to ease assembly.

Air Filter (See figure 4-5).

Description. The air filter consists of a shredded aluminum foil maze held between screens in an aluminum channel frame. The filter can be cleaned and re-used repeatedly. Airflow markings (arrows) on the frame make it easy to replace the filter in the correct position every time.

Removal. Remove the air filter for servicing and maintenance as directed in the following steps:

(1) Turn six cam-lock studs in the frame of the evaporator air intake grille counterclockwise to lock them. Remove the grille.

(2) Remove two screws from the retaining strip at the right-hand side of the air intake compartment, and remove the air filter. Pull filter forward and to the left to remove it from left-hand retaining channel.

WARNING

Dry cleaning solvent (Fed. Spec. P-D-680) used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).

Cleaning. Immerse the filter in detergent solution or dry cleaning solvent (Fed. Spec. P-D-680). Agitate filter until dirt is removed, using a soft brush if necessary to remove caked-on dirt. Rinse in clear water or clean dry cleaning solvent. Drain, then hold filter horizontal

upside down for areas of packed or crushed maze material that would obstruct airflow through the filter. Inspect for deformation of the frame, and straighten if possible without crushing maze material. Replace if crushed, punctured, badly deformed or broken.

e. Installation. Install the air filter in accordance with the following instructions:

CAUTION

Make sure that airflow arrows on the filter frame point inward toward the fan intake when installing filter.

(1) Place the left-hand edge of the filter in the channel at the left side of the evaporator air intake chamber. Install the retaining strip on the right side of the filter, and secure with two screws.

(2) Position air intake grille on the front of the air conditioner. Secure it by turning six cam-lock studs counterclockwise.

4-17. Fresh Air Damper Control (See figure 4-8).

a. Description. The fresh air damper is a spring-loaded door, which is closed to any degree by a ball-chain assembly. The ball chain is held at its desired position by a detent washer that accepts the links between balls in a slot, thereby holding the chain by the balls. A coil spring keeps the chain in the slot at all positions except fully closed, and acts as a snubber to minimize the shock of closing of the damper door.

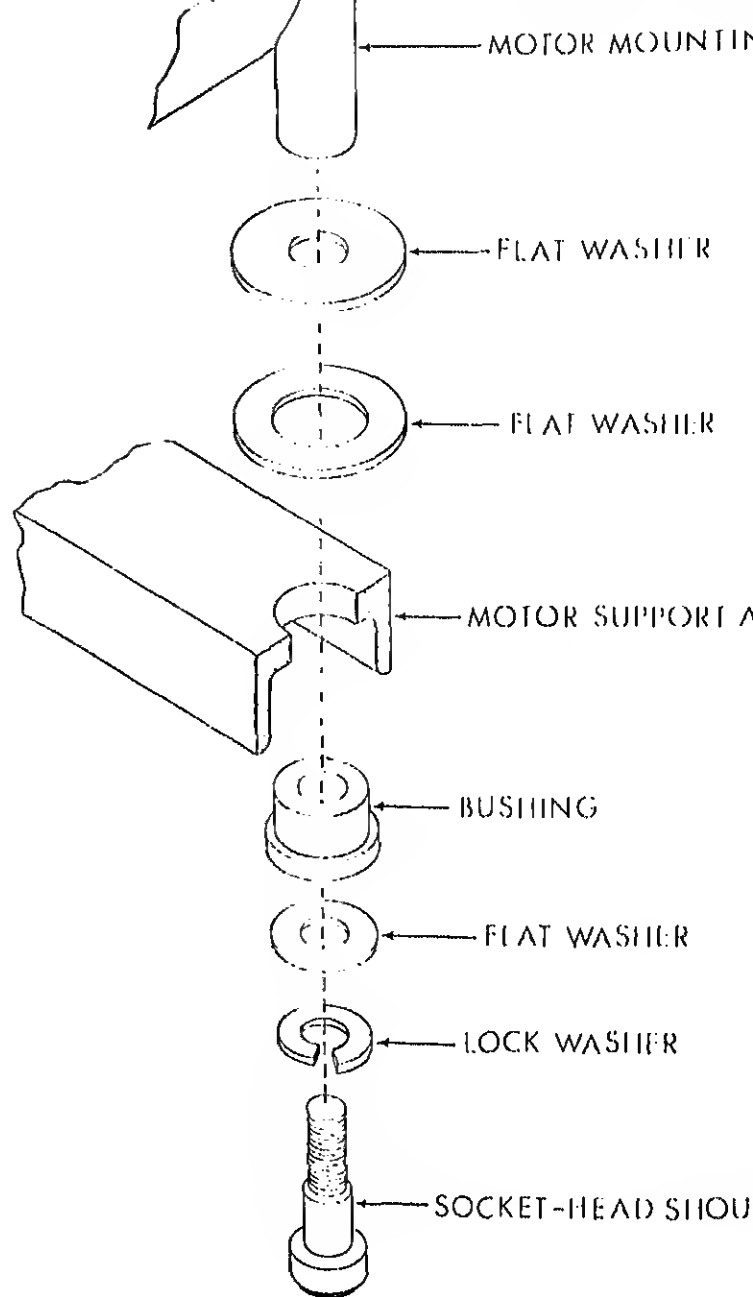
b. Removal. Remove the damper control chain and snubber spring as follows:

(1) Remove the fresh air screen from the rear face of the air conditioner, (figure 4-1) and pry the fresh air damper door closed with a piece of wood or other suitable object.

(2) Unhook the coil spring from the clip that attaches the chain to the door. Drill out rivet and remove clip, chain and coil spring.

c. Lubrication. Lubricate the hinge of the fresh air damper door with a few drops of light machine oil. Work the door back and forth a few times to work oil into the hinge joints. When the door operates freely, wipe off excess oil with a cloth or paper.

d. Installation. Install and adjust the fresh air damper control chain and spring as directed in the following steps:



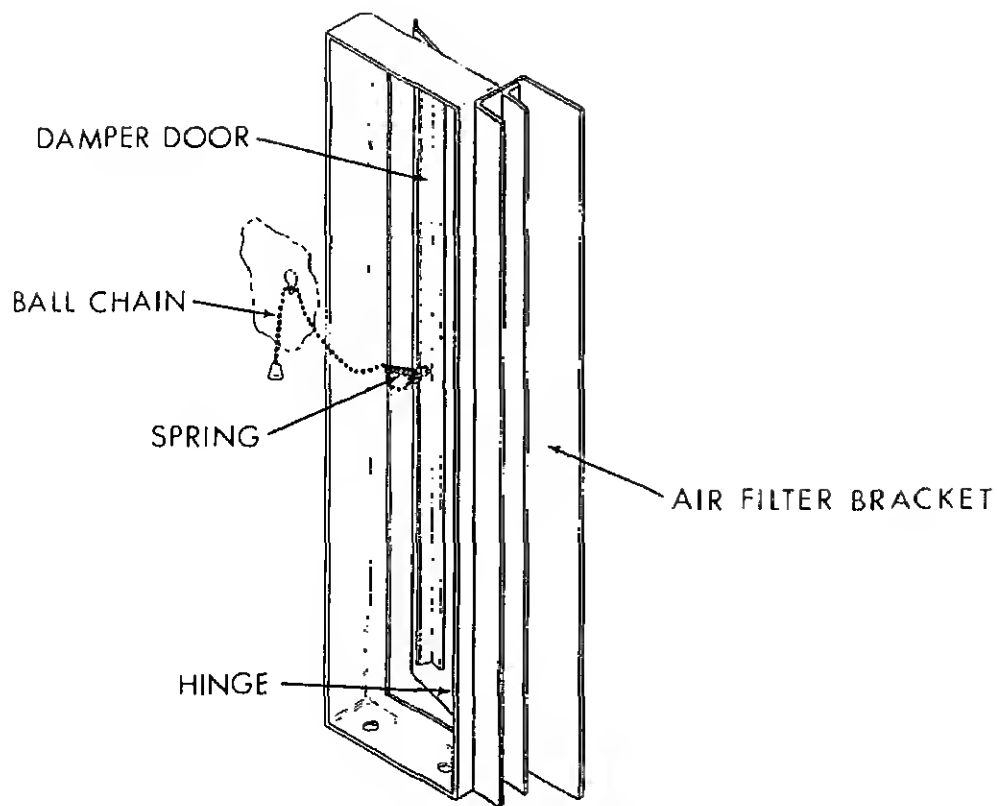


Figure 4-8. Fresh Air Damper Details

ninth and tenth balls from the accommodated.

(3) Thread the free end of the chain through the hole in the edge of the casing, and lower it into the retent slot.

(4) Thread the free end of the chain through the top of the pendant, and crimp the retaining sleeve over the last ball on the chain.

(5) Remove the door prop, if still in place, and attach fresh air screen to back of air conditioner with five screws.

(6) Position the air intake grille on the front of the air conditioner, and secure by turning the six cam-lock studs counterclockwise.

4-18. Mist Eliminator (See figure 4-5).

a. Description. The mist eliminator is composed of eight double layers of aluminum mesh held between 1/4-inch mesh panels in an aluminum frame. The purpose of the mist eliminator is to trap droplets of condensate water formed on the evaporator coil, so that they will not be blown into the air conditioned space.

b. Removal. To remove the mist eliminator from the air conditioner for servicing and inspection, perform the following steps:

(1) Remove 18 screws and washers from the four edges of the fabric cover, and remove the fabric cover.

(2) Remove 15 screws and parking washers from the top surface of the top panel, and five screws from the rear flange of the panel. Remove the top panel.

(3) Pry or lift up the mist eliminator at the outer ends of the bottom member of the frame. Slide the mist eliminator out of channels to remove.

c. Cleaning. Clean the mist eliminator by agitating in detergent solution. Rinse in clear water, and blow dry with compressed air, or tap each side on the bench or floor while holding the mist eliminator horizontal, to dislodge droplets.

d. Inspection. Inspect the mist eliminator for obvious damage, such as cuts, large perforations or serious deformation. Accept perforations up to 3/8-inch diameter. Straighten bent or deformed sections if possible. Replace the mist eliminator if damage exceeds repairable limits.

e. Installation. Install the mist eliminator in the air conditioner as directed in the following steps.

(1) Orient the mist eliminator with the TOP mark up, and the airflow arrows pointing outward, away from the evaporator coil. Slide the mist eliminator

into channels until the top and bottom flanges of the

4-19. Block-Off Panel

a. Description. The block-off panel is a sheet-metal fabrication designed to close the panel opening in the lower panel. The block-off panel is mounted in a remote location (see figure 4-3). The control panel opening must be closed to prevent air from being drawn into the control panel of the air conditioner, thus bypassing the evaporator coil and reducing the efficiency of the air conditioner. The block-off panel contains two covered openings for use as connector openings for power and ground control wiring harness receptacles.

b. Installation. After the control panel has been removed from the air conditioner, install the block-off panel in accordance with the following directions.

NOTE

It is presumed that an extension cable with mating connectors will be fabricated locally to extend the control wiring from the air conditioner to the remote location of the block-off panel.

(1) Mount the block-off panel in the lower panel with the vertical face forward, on top of the lower panel. Install the four screws removed from the control panel to secure the block-off panel.

(2) Remove four screws from the control panel wiring harness receptacle cover. Remove the cover. Install the wiring harness in the opening. If the power supply is not connected at the block-off panel, connect the power input receptacle to the remaining open terminals of the block-off panel, and transfer the wiring harness to the original location of the receptacle.

(3) Install the lower panel, and secure with the panel fastener screws. Connect wiring harness to the

4-20. Instruction Plates (See figure 4-6)

a. Removal. Drill out the rivets securing the instruction plate to the casing or panel. If the instruction plate is a functional part of the air conditioner (such as the pressure cutout switches) be careful

...ive enough to have caused significant damage to the major components. In such a case it is necessary to install a new casing assembly, and to dismantle the damaged unit completely, test all components, and install serviceable components in the new casing. Non-serviceable components must be replaced.

Inspection. Inspect the casing assembly for dents, scratches, cuts or tears, and major deformation. Remove components as necessary to determine whether internal components such as coils, wiring, piping or other components or sub-systems have been damaged. If damage is apparent, leak-test all parts of the refrigeration system and make an operating check of controls and functional components. If the unit is operationally OK, repair the casing.

Repair. Straighten dents by using a sheet-metal hammer and back-up dolly, using care to avoid stretching the metal more than necessary. Fill gauges with body putty, fiberglass-epoxy filler, or weld. Weld or repair tears if possible, or fabricate a patch and attach it with blind rivets. Sand paint to a feather edge around the repair, and paint as directed in TM 43-

Insulation

Description. Insulation consists of sheets of foam plastic or foam rubber, attached with adhesive.

Inspection. Inspect insulation for areas of loose-ness or separation from the metal panel, and for missing areas. Replace damaged or missing insulation.

Removal.

WARNING

Acetone and methyl-ethyl ketone (MEK) are flammable, and their vapors are explosive. Prolonged or repeated inhalation of fumes or contact with the skin can be toxic. Use in a well ventilated area, wear gloves, and keep away from sparks or flame.

Peel or pull off as much of the damaged insulation as possible. Soften the remaining insulation and remove with acetone or MEK, and remove with a knife, paint scraper or similar tool. Repeat the peeling and scraping process as required, then clean the metal surface with a cloth moistened in acetone or MEK.

Installation. Cut a sheet of the proper insulating

...to the fingers. Starting at one corner or at one edge, carefully bring the insulation into full contact with the metal. Press into firm contact all over

4-23. Condensate Drainage System (See 4-9).

a. Description. The condensate drainage system consists of a drip pan, mounted beneath the evaporator coil, and two tubes leading from the end of the drip pan to the base plate. The tubes are equipped with spring-loaded ball check valves at their ends, to prevent the bypassing of air through the tubes and around the evaporator intake. The base plate of the air conditioner is fitted with pipe-threads for the attachment of standard plumbing fittings and hose to conduct the condensate of a remote location.

b. Access. Since the condensate drainage system occupies both sides of the front of the air conditioner, from top to bottom, the top panel, lower panel, both evaporator grilles must be removed to access the system. Also, the air filter and the mist eliminator must be removed. Proceed as follows:

(1) Remove 18 screws and washers from the edges of the fabric cover, and remove the fabric cover.

(2) Remove 15 screws and packing washers from the top surface of the top panel, and five screws through the rear flange. Remove the top panel.

(3) Both the evaporator discharge and return grilles are removed by turning six cam-lock screws in their frames counter-clockwise to unlock them. Remove the grilles.

(4) Remove the mist eliminator by pulling it straight up.

(5) Remove the air filter by removing two screws from the retaining strip on the right-hand edge of the filter. Pull the right-hand edge of the filter out of the frame and to the right to remove it.

(6) Remove the lower panel by unscrewing the two panel fastener screws in the top edge, and pull the panel upward and out.

c. Flow-testing. Place a 3/4-inch board under the right side of the air conditioner to tilt it slightly, then pour about one pint (one-half liter) of water into the drip pan at the end of the drip pan below the evaporator coil. Verify that the water flows out of the drip pan through the drain tube. Tilt the air conditioner the opposite way, and repeat the flow test on the other side. Water should drain freely through both tubes. If it does not, remove and repair or replace the drain tube.

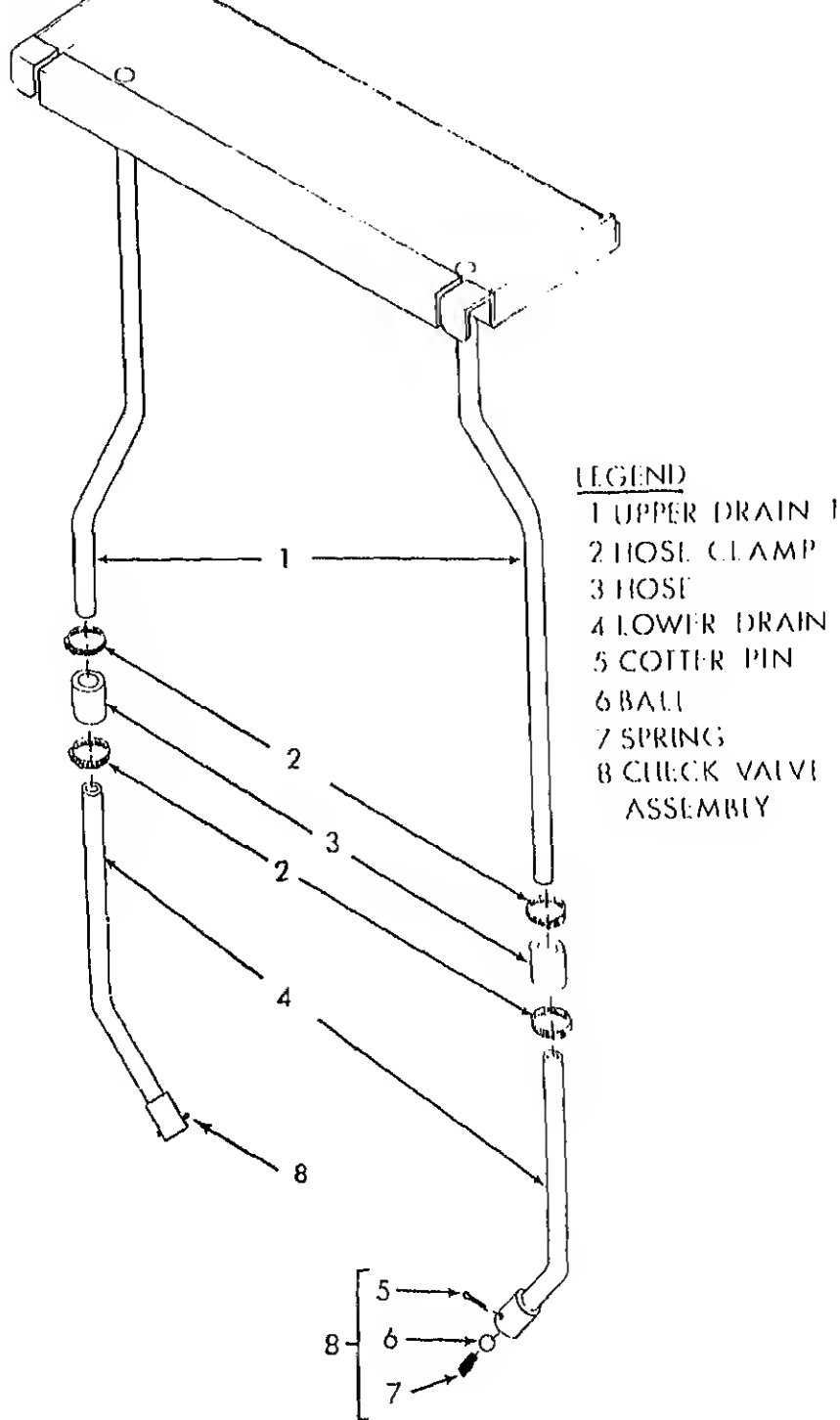


Figure 4.9 Condensate Drain

the tube away from the casing.

(3) Twist and pull the tube downward to remove it from the hose. If hose remains attached to the lower drain tube, remove from the air conditioner and twist or cut hose from the tube.

(4) Place a container below the end of the upper drain tube (1) and repeat the water flow-test to make sure that the obstruction is not in the upper tube. If it is, move it with a flexible wire with a small hook on the upper end.

(5) If the obstruction is in the lower drain tube, tighten the ends of the cotterpin, hold one hand on the lower end of the check valve assembly to prevent loss of the spring (7), and withdraw the cotterpin. Remove the ball (6), and push a flexible wire through the tube to dislodge the obstruction. Flush the tube thoroughly with hot running water.

Assembly. Assemble the drain tube assembly in accordance with the following procedure:

(1) Insert ball and spring into body of check

(2) Compress the spring below the level of the cotterpin, insert the cotterpin through both walls of the check valve, and spread the ends of the cotterpin.

(3) Slide a length of hose over the upper drain

drain tube along the side of the casing, and press into the clips in the front corner. Bend clips slightly to retain tube in position, then tighten the lower clamp.

(5) Install mist eliminator by pushing it into channels in front of the evaporator coils. Make sure that airflow arrows point away from the coils and that TOP marking is up.

(6) Install air filter in front of evaporator coils. Make sure that airflow arrows point inward. Engage the left side of the filter in the channels in front of the fresh air damper. Install the retaining strips on the right-hand side, and secure with two screws.

(7) Install the air intake and discharge louvers, and secure in place with six cam-lock studs and nuts, turning them clockwise.

(8) Position the top panel on the air conditioner, and secure with 15 screws and packing washers through the top surface and five screws through the rear surface.

(9) Fit the fabric cover over the rear surface of the air conditioner so that eyelets match the screw holes in the casing. Secure with 18 screws and washers.

(10) Install the lower panel on the air conditioner, and secure with two panel fasteners on each side of the upper edge.

Section I. MAINTENANCE OF CONTROL PANEL

Description (See figure 5-1).

The control panel assembly is mounted on top of junction box behind the lower panel. It contains three controls by means of which all functions of air conditioner are controlled. These controls comprise the following:

Mode Selector Switch. This is a five-position rotary switch consisting of four "wafers" or individual position elements. Each position of the switch affects various functional units in each mode of operation.

Temperature Control Thermostat. This thermostat is set at the desired temperature level to heat or cool the conditioned area in accordance with a back signal from a sensing bulb which causes the fan to open or close on temperature rise or temperature drop.

Two-speed Fan Switch. This two-position switch connects or disconnects an auxiliary set of windings in evaporator/condenser fan motor. When connected, the windings double the speed of the motor from 1725 rpm to 3450 rpm, thereby increasing airflow.

Removal

WARNING

Disconnect power from the air conditioner before performing maintenance on the electrical system. The voltage used can be lethal.

Remove the control panel assembly from the air conditioner in accordance with the following instructions:

1. Unscrew two panel fastener screws from the top of the lower panel, and remove the panel.

2. Unscrew and disconnect the electrical connector from the receptacle on the left end of the control panel housing.

3. Disconnect the evaporator air intake grille by turning six cam-lock studs in the frame a quarter-turn clockwise. Remove the grille.

d. Remove one screw from the loop clamp supporting the thermostat sensor bulb.

e. Remove four screws from the corners of the control panel mounting flange, and carefully withdraw the control panel assembly while leading the sensing bulb and its associated capillary tube through the grommeted hole to remove it. Coil the capillary tube without kinking.

5-3. Disassembly

Disassemble the control panel only to the extent required for repair or replacement. Proceed as follows in the following steps:

a. Pull the knobs off the mode selector switch and the temperature control thermostat.

b. Remove the panel mounting nuts from the two-speed fan switch and mode selector switch.

c. Remove four screws and self-locking nuts securing the back panel to the housing. Carefully separate the panel from the housing.

d. Tag and remove wires from the two-speed fan switch.

e. Remove the four screws and self-locking nuts securing the mounting flanges of the temperature control thermostat to the rear cover. Press the sensing bulb and grommet out of the notch in the rear cover. Separate the temperature control thermostat from the control panel assembly.

f. Remove four screws and self-locking nuts securing the wiring harness receptacle, and remove the harness from the control panel assembly.

5-4. Inspection/Test

Inspect non-functional parts of the control panel assembly for damage. Replace damaged parts and operating components as follows, using an ohmmeter, multi-meter or other continuity tester.

a. Check continuity of the mode selector switch in all positions, in accordance with the following instructions:

b. Attach the continuity test leads to the yellow contacts of the temperature control thermostat, and place the sensor bulb in a container of water (25° to 100°F). Connect the

5. HOUSING
6. DATA PLATE
7. KNOB
8. TWO-SPEED FAN SWITCH
9. WIRING HARNESS

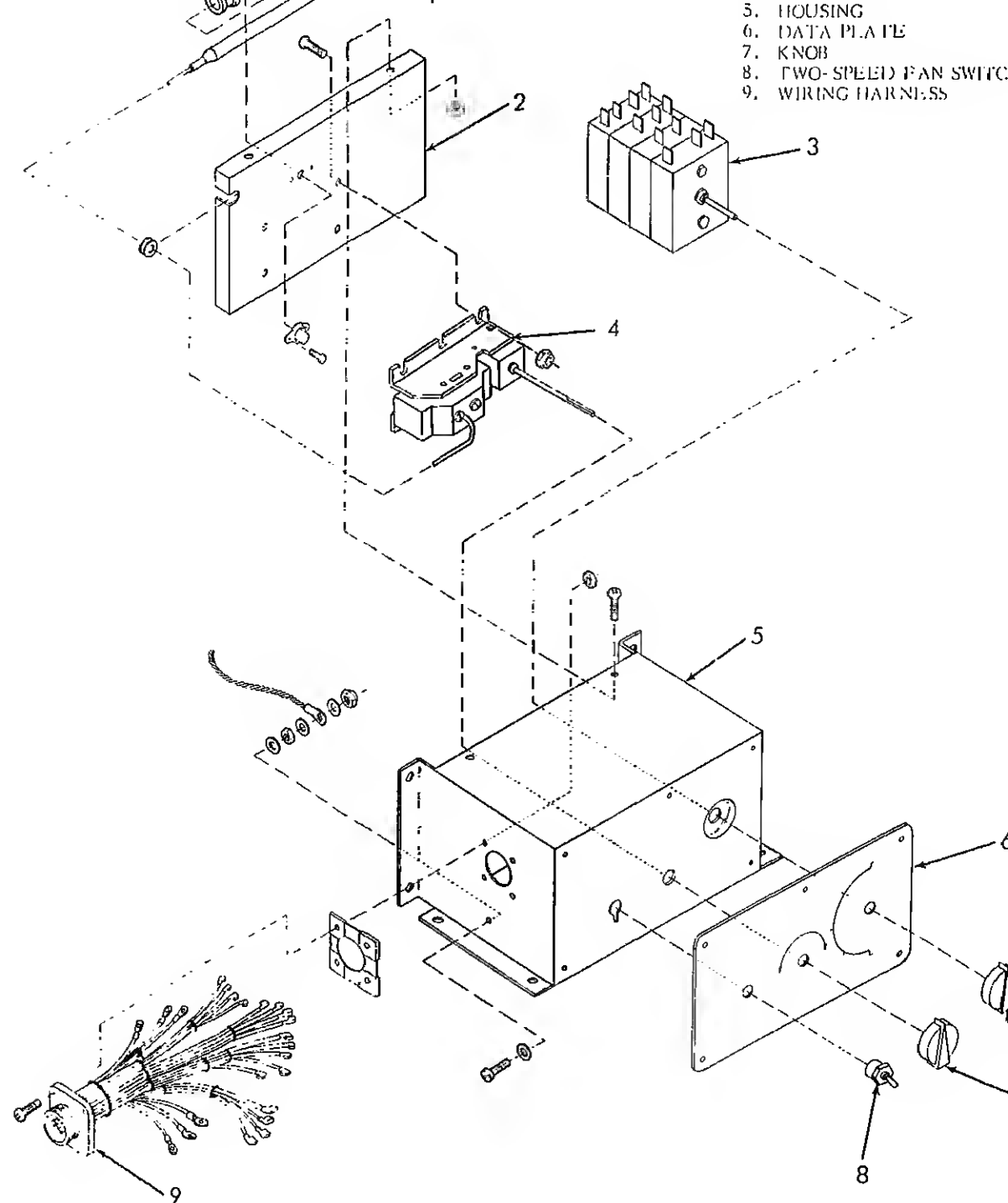


Figure 5-1. Control Panel Details

POSITION		S1A	S1B	S1C	S1D
1	HEAT (HIGH)	12 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C 32 AND 3A	41 AND 4C 42 AND 4A
2	HEAT (LOW)	12 AND 1A	21 AND 2C 22 AND 2B	31 AND 3C	—————
3	OFF	—————	—————	—————	—————
4	VENT		21 AND 2C 22 AND 2B	31 AND 3C	
5	COOL	12 AND 1B 11 AND 1D	21 AND 2C 22 AND 2B	31 AND 3C 32 AND 3B	41 AND 4C 42 AND 4A

Attach the continuity test leads to the red and blue contacts of the temperature control thermostat, and place the sensor bulb in a container of cold water (65° F or 5° - 18°C). Check the continuity of the thermostat throughout the INCREASE range. Continuity should be indicated.

Check continuity of the two-speed fan switch in both positions. Continuity should be indicated in the ON position, but not in the OFF position.

Check the continuity of each pin and attached wire in the wiring harness. Continuity should be indicated from each pin to the plug or shell. Continuity should not be indicated.

If any component or part does not meet continuity requirements, replace it.

Assembly

Assemble the control panel in accordance with the wiring instructions.

Install the wiring harness receptacle in the wall and the control panel housing, and secure with four screws and self-locking nuts.

Connect leads to the grounding stud and to the two-speed fan switch. Install the switch through the hole in the front of the control panel. Secure with a lockwasher and panel mounting nut.

Connect wire leads to the mode selector switch, and install the switch through the hole in the front of the control panel. Secure it with a lockwasher and panel mounting nut.

Attach the temperature control thermostat to the

rear cover of the control panel assembly, using screws and self-locking nuts. Connect wire leads to the thermostat. Split and install grommet on capillary tube and install tube and grommet in notch in rear cover.

e. Carefully install rear cover in control panel assembly. Secure with four screws and self-locking nuts.

5-6. Installation

Install the control panel assembly in the air conditioner as directed in the following steps:

a. If the control panel is not to be removed, lead the thermostat sensor bulb and capillary tube through the hole in the right-hand corner of the evaporator air intake chamber. Mount the sensor bulb on the wall, using a loop clamp and screw. Split a grommet radially from the center outward, and install around the capillary tube in the hole. Seal with caulking compound.

b. Position the control panel on the junction box and secure with four screws through the corner mounting flange.

c. Connect plug, P7, to the wiring harness receptacle.

d. Position the lower panel on the air conditioner and secure with the two panel fastener screws.

e. Install the air filter in retaining channel using spring clip in the air intake chamber, and position the air intake grille on the air conditioner. Secure with six cam-lock studs in the frame.

It provides housing or mounting facilities for electrical components that control the automatic starting of power and control circuits to the various operating components of the air conditioner. These components include the control transformer, rectifier, pressure relays, the time delay relay, the circuit breaker, and associated fuses and terminal blocks.

Removal



Disconnect power from the air conditioner before performing maintenance on the electrical system. The voltage used can be lethal.

Unscrew two panel fastener screws in the top of the lower panel, and remove the panel.

Disconnect plug P7 from the left end of the control panel assembly, then remove four screws from the top of the control panel mounting flange. Support the control panel out of the way, being careful to avoid kinking the thermostat sensor capillary tube.

Unscrew four panel fastener screws in the mounting flanges at each end of the junction box.

Bend the end of the push-pull circuit breaker flexible cable (8) straight. Loosen the setscrew at the end of the core end fitting (5), and slide off the end fitting.

Remove screws from the two loop clamps (9) holding the flexible cable, and remove the flexible cable from the junction box and the circuit breaker terminal arm connector plate (7).

Pull the junction box forward, and disconnect the wiring harness plugs, P2 and P3, from receptacles (19 and 20) on the junction box.

Remove the junction box from the air conditioner.

Disassembly

Disassemble the junction box only to the extent necessary to test and replace components, in accordance with the following procedure:

Unscrew four panel fastener screws from the top and bottom edges of the junction box cover, and remove the cover.

Pull fuses (17 and 18, figure 5-2) out of their holders.

Tag and disconnect wire leads from components.

Remove four screws, washers and self-locking

components from the junction box, making them from the junction box. Unless complete replacement is necessary, remove only those components that fail to pass inspection/test.

e. Remove mounting hardware from components necessary to dismount them from the junction box and remove the components.

5-10. Inspection/Test

Inspect all parts of the junction box and its components for obvious damage, missing parts, and evidence of electrical failure such as burnt spots or spattered metal. Perform continuity and functional tests on components as indicated in the following steps:

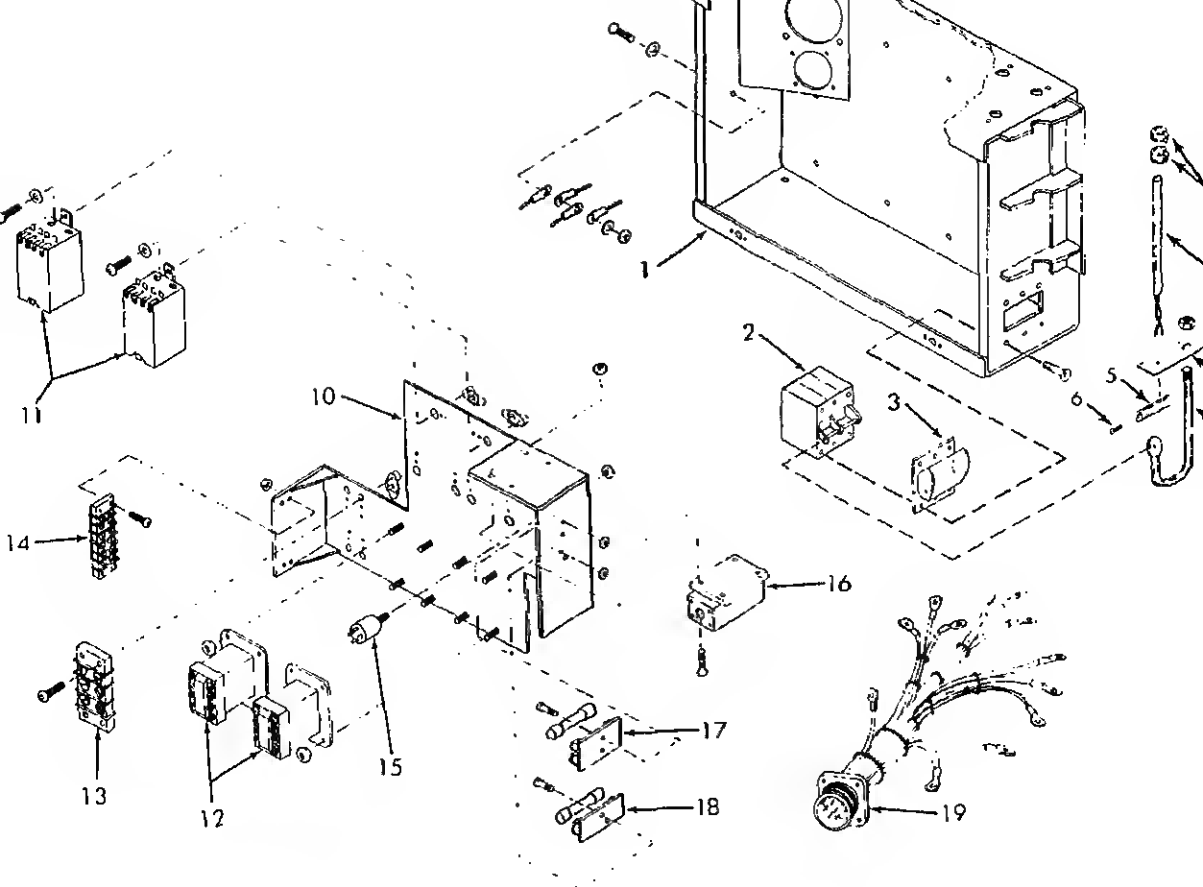
a. *Fuses.* Remove fuses, one at a time, from their holder clips and check continuity with an ohmmeter, multimeter or other continuity tester. Continuity should exist. If it does not, replace the fuse.

NOTE

When continuity testing of components is required, the ohmmeter, multi-tester or other continuity tester should be set on low resistance (ohms) for checking continuity of coils, direct connections, etc. For checking possible short circuits, as between coil and casing or common ground, a high-resistance (ohms) setting should be used.

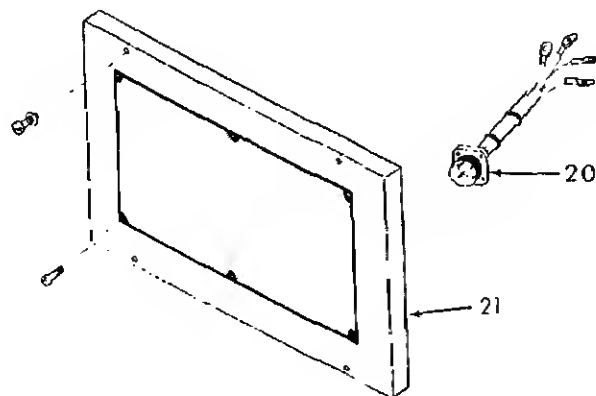
b. *Circuit Breaker.* Reset the circuit breaker by pressing the handle up, then down. Check continuity of each phase (A1-A2, B1-B2 and C1-C2) and the neutral auxiliary switch (C-NO). If continuity is not indicated on all circuits, replace the circuit breaker. If load testing equipment is available, test each phase (A, B, C) of the circuit breaker. The circuit breaker should hold 25 amperes continuously, and should trip within 0.5 seconds when a 25-ampere load is applied. If load testing equipment is not available, and circuit breaker trips frequently, substitute a circuit breaker known to be good, and check operation.

c. *Heater and Compressor Relays.* (K1, K2) Check continuity of terminals X1-X2. If continuity is indicated, apply 26-28 volts dc to terminals X1-X2, and check continuity of terminals A1-A2, B1-B2 and C1-C2. Continuity should exist. If it does not, replace relay.



END

JUNCTION BOX
CIRCUIT BREAKER
CIRCUIT BREAKER COVER
ACTUATOR ARM
END FITTING
SETSCREW
CONNECTOR PLATE
FLEXIBLE CABLE
LOOP CLAMP
PANEL
RELAY
RELAY
TERMINAL BOARD
TERMINAL BOARD
RECTIFIER
TIME DELAY RELAY
FUSE AND FUSE HOLDER
FUSES AND FUSE HOLDER
WIRING HARNESS
WIRING HARNESS



Continuity of terminals A1-A2, B1-B2, C1-C2 and D1-D2. should indicate continuity. If continuity requirements are not met, replace the relay.

Time Delay Relay (K3). In addition to your continuity testing equipment, you will need a clock or watch on which seconds can be read for this test. Proceed as follows:

(1) With the time delay relay disconnected, check continuity between terminals 2 and 4. Continuity should be indicated.

(2) Semi-permanently connect the test prods to terminals 2 and 3. While observing the clock or watch, apply a source of 26-28-volt dc power to the dc terminals of the time delay relay, making sure to apply positive (+) to positive and negative (-) to negative.

(3) Continuity should be indicated after a delay of 9 to 31 seconds. If the delay is not within limits, or continuity requirements are not met, replace the time delay relay.

Transformer (T). Check continuity of terminals H2 and X1-X2. Continuity should exist. Check continuity between H1 and casing or common ground, and between X1 and casing or common ground. Continuity should not exist. Connect the test leads of a voltmeter to terminals X1-X2, and apply 208 volts, 60 hertz to terminals H1-H2. The voltmeter should indicate 30 ± 3 volts (rms). If transformer does not meet both continuity and voltage requirements, replace it.

Terminal Boards (TB1, TB2). Inspect the terminal boards for obvious damage and evidence of electrical failure. Check continuity across each pair of terminals. Replace if damaged or if continuity requirements are not met.

Electrical Receptacles. Inspect for deformation, damaged threads and cracked or broken wafers. Check continuity from each pin of the connector to the terminal end of its associated wire lead. Continuity should exist. Check continuity from each pin to the shell of the connector. Continuity should not exist. Replace the receptacles if they indicate damage, or if continuity requirements are not met.

Rectifier (CR1). With an ohmmeter set at 2000 ohms, check for continuity between each terminal and

Using a dc voltmeter, check terminals 2 (-) and 3 (+) for 26-32 volt dc output. Replace the rectifier if the continuity and the voltage requirements are not met.

Diode Semiconductor (CR2). Apply the test leads of an ohmmeter to the leads of the diode, and observe the meter. Then reverse the leads, and again observe the meter. The meter should indicate resistance in one direction, and show no indication in the other. If the ohmmeter indicates resistance in both directions, the diode is short-circuited; if there is no reading in either direction, the circuit is open. Replace the diode if short- or open-circuit exists.

5-11. Assembly

Position components over studs or anchor nuts as required, and secure with the appropriate mounting hardware. Install wiring harness receptacle, mounting holes, and secure with four screws, washers, and self-locking nuts in each. Connect terminal wiring harnesses to components as required. (See wiring diagram, figure FO-1 for proper connections.)

5-12. Installation

Install the junction box in the air conditioner as directed in the following steps:

a. Connect wiring harness plugs, P2 and P3, to their respective receptacles on the junction box.

b. Insert the end of the circuit breaker reset cable (figure 5-2) through the hole in the connector plate. Install core end fitting on end of cable, then attach the sheath of the cable to the junction box with two clamps (9) and screws, leaving at least 1/4-inch of cable sheath below the bottom loop clamp.

c. Attach the junction box to the support bracket using four panel fastener screws.

d. Adjust the cable and fitting on the circuit breaker reset cable so that there is 0.12-0.25 inch (3-5 mm) between the end fitting and the connector plate when the circuit breaker handle is down and the flexible cable fully extended. Tighten the setscrew in the end fitting, and bend 0.12-0.25 inch (3-5 mm) of the cable 90 degrees.

Section III. MAINTENANCE OF RFI FILTER

13. Description

Essentially, suppression of radio frequency inter-

wires, grounding the frame with bonding straps and using capacitors and resistors. The air condition-

receptacles.

4. Removal

Remove the radio frequency interference (RFI) filter from the air conditioner as indicated in the following procedure: (See figure 5-3).



Disconnect power from the air conditioner before performing maintenance on electrical components. The voltage used can be lethal.

Remove eight screws from the four edges of the mounting plate.

Pull the filter housing and mounting plate outward as far as possible, and disconnect electrical plugs, P10 and P11, from receptacles on the top of the filter housing.

Remove six screws near the top and bottom edges of the mounting plate to release the filter housing. Separate the housing from the mounting plate.

5. Inspection/Test

Inspect the housing and mounting plate for physical damage such as dents, punctures or cuts. Look for evidence of overheating or burning, melted potting compound, arcing at terminals, etc. Replace the filter if evidence is found. Check point-to-point continuity between connector pins as shown in the following Table:

A	A	Continuity
A	B	No continuity
A	C	No continuity
A	D	No continuity
B	B	Continuity
B	C	No continuity
B	D	No continuity
C	C	Continuity
C	D	No continuity
D	D	Continuity

If filter does not meet continuity requirements, replace it.

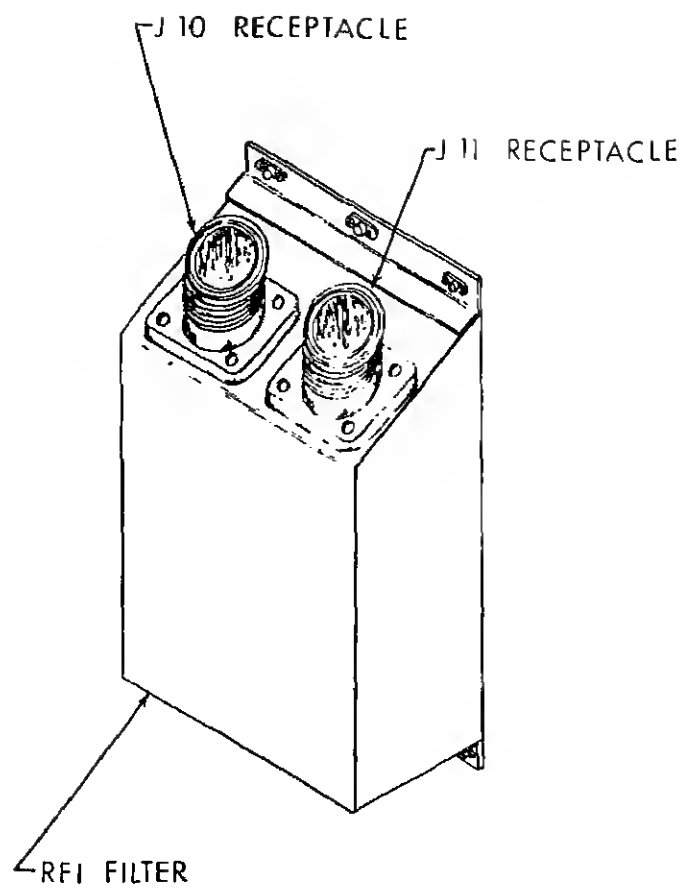
NOTE

Continuity testing does not necessarily predict the behavior of capacitors under load. If the filter still does not operate properly after passing the continuity test, substitute a filter known to be good, and check for emission.

5-16. Installation

Install the RFI filter as follows:

- Position the filter housing (figure 5-3) on the mounting plate and secure with six screws.
- Connect wiring harness plugs, P10 and P11, to receptacles on top of the filter housing.
- Insert filter into air conditioner opening. Position mounting plate on casing. Secure with six screws around edge of mounting plate.



Description

The refrigeration compressor is a self-contained unit which incorporates a reciprocating compressor, a motor and a lifetime charge of oil hermetically sealed into a dome-shaped steel housing. A resistance crankcase heater is mounted around the outside of the compressor housing near the base. The purpose of the crankcase heater is to prevent migration of refrigerant into the compressor in cold weather. If refrigerant could mix with the oil, causing the oil to be pumped throughout the system. Also, fluids are incompressible and would cause serious damage to the compressor if permitted to enter it while operating.

Access

Gain access to the compressor as directed in the following procedure:

WARNING

Disconnect power from the air conditioner before performing maintenance on the electrical system. The voltage used can be lethal.

Unscrew two panel fastener screws in the upper part of the lower panel and remove the panel. Straighten the end of the circuit breaker reset button, loosen the setscrew in the end of the cable end fitting, and remove the end fitting.

Remove screws from two loop clamps securing the flexible cable to the junction box, and remove the cable from junction box and circuit breaker actuating connector plate.

Unscrew two panel fastener screws in the mounting flanges at each end of the junction box.

Disconnect wiring harness plug from receptacle at end of control panel assembly, and remove four screws from the corners of the control panel mounting flanges. Reconnect the wiring harness plug to support control panel assembly.

Slide wiring junction box out, and disconnect wiring harness plugs from receptacles on rear surface. Remove junction box.

Inspection/Test

using an electronic leak detector, or soap solution to detect bubbles. If mounting bolts are loose, tighten them. If leaks are detected in the compressor housing, charge the refrigeration system and replace the compressor. If electrical trouble is indicated, check continuity as follows:

a. Disconnect plug, P4, from the electrical junction box on the compressor.

b. Check continuity of the following pairs of pins at receptacle J4: Compressor motor windings A-B and A-C, and the normally closed thermal overcurrent on pins D and E. Also check crankcase heater thermostat on Pins F and G. Continuity should exist between compressor housing and pins A,B,C, and D. If continuity requirements are not met for pins A,B, and C or D and E, replace the compressor. If continuity requirements are not met for pins F and G, replace the crankcase heater or thermostat as required.

6-4. Removal of Crankcase Heater

Remove the crankcase heater from the compressor as directed in the following steps:

a. Remove the retaining spring (7, figure 6-1) from the ends of the crankcase heating element (6).

b. Remove compressor junction box cover (4) and remove electrical receptacle (2) by removing screws.

c. Unsolder wire lead from heating element at electrical receptacle pin G and cut splice to heater thermocouple lead.

d. Spring the ends of the heating element slightly so that the heating element can be maneuvered around and over the top of the compressor housing to remove it.

6-5. Installation of Crankcase Heater

Install the crankcase heater as follows:

a. Maneuver the crankcase heating element over the top of the compressor, and down to the lower part of the compressor housing. Do not spread the ends of the heating element any more than necessary. Push retaining spring (7) over both ends of the heating element (6) to hold it in position.

b. Lead electrical wires from heating element into the compressor junction box (3). Slide a

Remove the compressor from the air conditioner in accordance with the following procedure.

System Discharge. Before removing any refrigeration component from the air conditioner, all refrigerant gas must be discharged from the system. Proceed as follows:

Removal of Compressor

Remove the compressor from the air conditioner in accordance with the following procedure.

System Discharge. Before removing any refrigeration component from the air conditioner, all refrigerant gas must be discharged from the system. Proceed as follows:

(1) Remove five screws from the frame of the air screen in the upper right-hand corner of rear surface of the air conditioner. Remove the air screen to obtain access to the suction and discharge service valves. (See figure 8-2 for identification of service valves).

(2) Remove the chained cap from the suction service valve, and connect a hose of sufficient length to a safe location, preferably outdoors, for discharge of refrigerant gas.

WARNING

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged from any container under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector in any situation where skin- or eye-contact is possible. Prevent contact of refrigerant gas with flame or hot metal surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

(3) Crack open the suction service valve to discharge refrigerant gas slowly, over a period of 4-6 minutes. Too rapid discharge will cause oil to be blown out of the system.

(4) Connect a cylinder of dry nitrogen to the discharge port of the discharge service valve. Open the discharge shutoff valve and the discharge service valve slowly, and completely open the suction service valve to purge the system of refrigerant gas. Use 1-2 cfm (0.2 M³/minute).

After using the nitrogen, be sure to prevent internal oxidation and scaling.

b. De brazing. With dry nitrogen flowing through the system, de braise tubing connections at any fittings near the compressor that will permit convenient removal. Tubing and fittings attached to the compressor after its removal can be transferred to replacement compressor before installation in the air conditioner.

c. Dismounting the Compressor.

CAUTION

When hoisting the air conditioner by means of a sling through the handholes, use a spreader bar to prevent the sling from damaging the casing.

(1) Hoist the air conditioner onto support blocks of sufficient height to permit insertion of a socket wrench through the compressor mounting holes in the base plate.

(2) Remove four shoulder bolts (9) and nuts, (10) four bushings (11) and eight of each size of washers (10 & 12) from the four support legs of the compressor. (See figure 6-1.)

(3) Lever the compressor up, and slide it out from the air conditioner.

8-7. Installation of Compressor

Install the compressor in the air conditioner in the following procedure:

NOTE

If refrigeration piping was disconnected with the compressor being replaced, transfer the piping to the replacement compressor before installing it in the air conditioner.

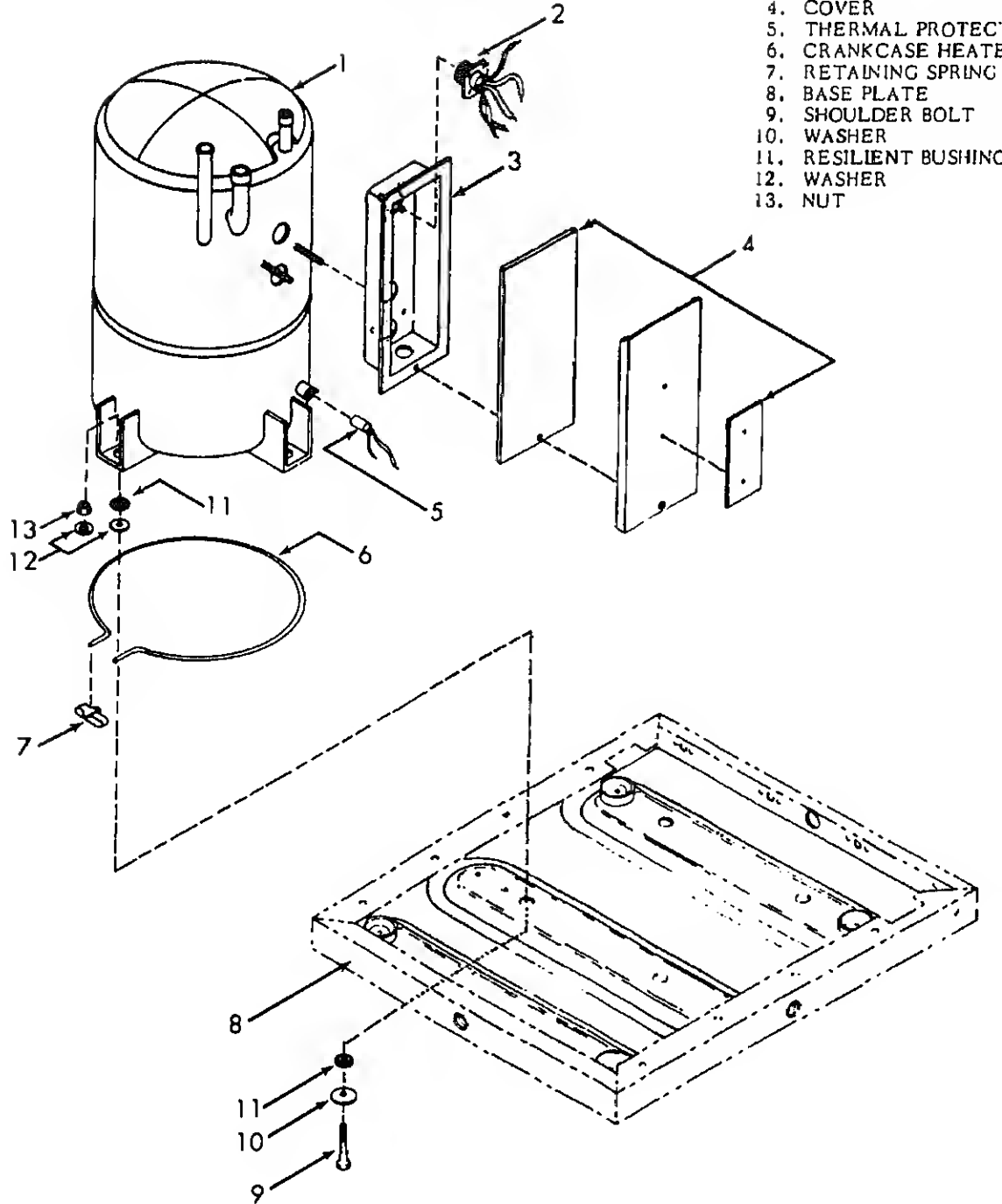
6-1.) Install shoulder bolt and
below, and install nut and washer on
g foot.

nnnection. Provide a 1-2 cfm (0.1 — 0.2
f dry nitrogen through the refrigeration
aze tubing joints to connect the com-

ent of Filter-drier.

NOTE

the refrigeration system has
ned, a new filter-drier must be
before re-charging.



- 4. COVER
- 5. THERMAL PROTECT
- 6. CRANKCASE HEATE
- 7. RETAINING SPRING
- 8. BASE PLATE
- 9. SHOULDER BOLT
- 10. WASHER
- 11. RESILIENT BUSHING
- 12. WASHER
- 13. NUT

the filter-drier, and remove band clamp and filter-drier.

CAUTION

Do not remove cap from the connections of a new filter-drier until ready to connect system tubing.

(3) Place band clamp on a new filter-drier in such position that the direction-of-flow arrow will point toward the system when installed. Attach the filter-drier and band clamp to the casing with the screw previously removed, or equivalent.

(4) Connect tubing to top and bottom of the filter-drier with flare nuts on tubing.

Leak Testing

Leak test the refrigeration system after repair or replacement of any component. Proceed as follows:

a. Refer to figure 8-2 for identification of service valves. Connect a pressure gauge to the suction service valve, and a cylinder of refrigerant R22 to the discharge service valve. Open both service valves and the cylinder shutoff valve. Let refrigerant flow into the system until the pressure gauge indicates 50 psig (3.5 kg/cm²). Close cylinder shutoff valve and discharge service valve, and disconnect the refrigerant cylinder.

b. Connect a cylinder of dry nitrogen to the discharge service valve. Open the cylinder shutoff valve and the discharge service valve, and pressurize the system to 350 psig (22 kg/cm²). Close all three valves, and test for leaks, using an electronic leak detector, or the soap bubble method as described below:

CAUTION

The electronic leak detector is sensitive to the presence of refrigerant gas in the atmosphere. When refrigerant gas is present in the atmosphere of the work area, false indications can result. Use in a well ventilated but draft-free area.

(1) **Electronic Leak Detector.** Turn the electronic unit on, and slowly pass the probe around all points of the refrigeration system at which a leak could exist. Depending upon the type of detector used, a leak will be indicated by an audible signal, a light, or by meter deflection.

c. Discharge the system after leak testing by connecting a hose to the suction service valve, and opening the valve open slightly to slowly discharge the system. Too rapid discharge will cause oil to be blown out of the compressor. If leaks were detected, repair the system and retest as directed above. If the system is tight, double evacuate and charge the system as directed below.

6-9. Evacuating The System

Before the system is charged with refrigerant, the system must be completely evacuated to exhaust water vapor, non-condensable gases and other impurities which would prevent the system from operating. Proceed as follows:

NOTE

The following instructions are provided for use by refrigeration shops furnished with only the most basic equipment. If more sophisticated equipment, such as two-valve or four-valve service manifolds is available, it should be used by making appropriate modifications to these instructions.

a. Refer to figure 8-2 for identification of service valves. Connect a vacuum pump to the suction service valve gauge port, and a vacuum gauge to the discharge service valve gauge port. Stop the pump, and open both service valves. Operate the vacuum pump until pressure in the system is reduced to not more than 500-microns. Close the suction service valve, and turn the vacuum pump off. Let the unit stand in this condition for at least three hours. If the system holds the vacuum without change of pressure, continue with step b. If the 500-micron vacuum cannot be held for three hours, break the vacuum with dry nitrogen and retest for leaks. If 500-micron vacuum cannot be achieved, one or more of the following reasons may account for the problem.

(1) Presence of water vapor in the system. Continued pumping will correct this condition.

(2) Leaks in the refrigeration system. Break the vacuum with dry nitrogen, and retest for leaks.

(3) Internal leakage of vacuum pump. Test the pump by connecting a vacuum gauge directly to the vacuum pump intake and continue to pump. If the gauge still fails to reach 500 microns, the pump is faulty.

b. With the suction line service valve closed, connect the vacuum pump and attach a cylinder of dry nitrogen. Leave the connection to the suction

...valve gauge port, and start the pump. Open the suction service valve, and again pump until a 500-in. Hg vacuum is achieved. This double evacuation will remove all traces of water vapor and non-condensable gas from the system. Close the suction service valve, and disconnect the vacuum pump. Close the discharge service valve, and remove the vacuum pump.

Charging The System

Refer to figure 8-2 for identification of service valves. Connect a cylinder of refrigerant, R22, to the discharge line service valve, and open the cylinder shutoff valve for a few seconds to purge the line of air. Tighten the service valve connection. Charge the refrigeration system as described in the following steps:

CAUTION

Do not attempt to charge liquid refrigerant into the suction line. The compressor would be damaged.

NOTE

Two kinds of refrigerant cylinders are in general use. One is equipped with a single shutoff valve, and must be inverted when charging liquid refrigerant. The other is equipped with a vapor valve and a liquid valve, which makes it possible to charge either liquid or vapor when the cylinder is upright. When using the two-valve cylinder; disregard instructions to position the shutoff valve down, and connect the service line to the liquid valve instead.

Place the refrigerant cylinder on a scale of sufficient capacity, with the shutoff valve down, or suspend the cylinder from a spring or beam scale, with the valve end down.

...kg) of refrigerant have flowed into the refrigeration system, close the discharge service valve and the cylinder shutoff valve.

NOTE

The junction box and control panel assemblies and the lower panel must be in place to operate the air conditioner and to complete the charging operation. If they were removed for maintenance, install them now, in accordance with paragraphs 5-10 and 5-12.

d. Check operation and top off refrigerant as necessary, in the following manner.

CAUTION

If knocking or pounding is heard when starting the air conditioner, shut down at once and release some refrigerant before attempting another start.

(1) With power connected to the air conditioner, turn the mode selector switch to COOL and the temperature control thermostat to the maximum DECREASE position. Let the air conditioner run for 15 minutes in this mode, then observe the sight-glass liquid indicator while the air conditioner is running. If bubbles or milkiness appear, top off refrigerant charge as follows:

(2) Connect the cylinder of refrigerant loosely to the gauge port of the suction service valve. Open the cylinder shutoff valve for a few seconds to purge air from the line. Tighten the connection and the cylinder upright.

(3) With the air conditioner compressor running, open the suction service valve and the discharge shutoff valve to charge refrigerant gas into the system. Continue to observe the sight-glass liquid indicator.

(4) When the liquid in the sight-glass indicator runs clear and free of bubbles, close the suction service valve and the cylinder shutoff valve.

(5) Disconnect the refrigerant cylinder, and pressure-test the air conditioner.

...ged after replacement of a component or
 on the air conditioner is operating inefficiently.
 ssure testing is accomplished by connecting in-
 dual pressure gauges or a refrigeration service-
 manifold to the suction line and discharge line
 service valves. (See figure 8-2 for identification of
 service valves).

...the condenser coil and the evaporator coil.

Table 6-1.

b. *Set-up.* Prepare the air conditioner for pressure testing as directed in the following steps:

TABLE 6-1

NORMAL TEMPERATURE — PRESSURE RELATIONSHIPS

95°F (35°C) dry bulb return air to unit					
Indoor ambient temperature	50°F 10°C	75°F 24°C	100°F 38°C	110°F 43.5°C	125°F 52°C
Gauge Pressures					
Suction (psig) (Kg/Cm ²)	56-60 3.93-4.22	56-65 3.93-4.57	65-75 4.57-5.27	70-80 4.92-5.62	75-90 5.27-6.3
Discharge (psig) (Kg/Cm ²)	135-155 9.50-10.90	185-205 13.00-14.41	275-295 19.33-20.74	375-380 26.36-26.72	400-425 28.12-29.9
80°F (27°C) dry bulb return air to unit					
Indoor ambient temperature	50°F 10°C	75°F 24°C	100°F 38°C	125°F 52°C	
Gauge Pressures					
Suction (psig) (Kg/Cm ²)	56 min. 3.93 "	56 min. 3.93 "	56-65 3.93-4.57	65-75 4.57-5.27	
Discharge (psig) (Kg/Cm ²)	130-150 9.14-10.55	180-200 12.65-14.06	270-290 18.98-20.39	290-410 20.39-28.82	

NOTE: Dry bulb temperatures are measured with an ordinary thermometer

(1) Make sure that the fresh air damper is completely closed, and that the evaporator air intake and discharge grilles are fully open.

(2) Hang an accurate thermometer directly in front of the evaporator air intake grille to register "dry bulb return air to unit" temperature.

(3) Hang an accurate thermometer directly in front of the condenser coil guard, making sure that the thermometer is shaded from direct sunlight, to record "indoor ambient temperature."

(4) Connect a set of Bourdon-type refrigeration pressure gauges or a refrigeration service manifold

(5) If indoor ambient temperature is too low, provide a space heater to raise the "dry bulb return air to unit" temperature to 80°F (27°C).

c. *Procedure.* Perform the pressure test in the following manner:

(1) Turn the selector switch to COOL, and set the temperature control thermostat to maximum. Press the DECREASE.

tem are stabilized.

(4) Record the temperatures indicated by both thermometers and the pressures indicated by both pressure gauges.

(5) Compare the readings obtained from pressure with the normal ranges shown in Table 6-1.

d. Analysis of Discrepancies. If actual pressure-temperature relationships differ from those shown in Table 6-1, consider the following reasons, and take appropriate action.

(1) If pressures are too low: Check for leak (paragraph 6-8), repair, recharge the system (paragraphs 6-9 and 6-10), and repeat the pressure

(2) If pressures are too high: Close the suction service valve, remove the pressure gauge, and bleed

ble, recharge if necessary, and repeat the pressure

Completion. After pressure testing has been successfully completed, close both service valves, remove caps, install caps on service valves, and install fresh green, using five screws to secure it. Remove thermometers from the unit.

Compressor Motor Burnout.

Burnout of a compressor motor is indicated by lack of continuity of the motor windings and the condition of the compressor oil, which must be determined after the compressor has been removed from the refrigeration unit. Causes of compressor motor burnout include the following:

Low line voltage. which causes motor windings to overheat. Before burning out completely, the overheated windings cause chemical breakdown of the refrigerant and the oil to form sludge and other harmful contaminants.

Loss of refrigerant. An inadequate charge of refrigerant gas in the system reduces the amount of cooling gas within the compressor, resulting in unusual overheating of the motor and failure of the motor.

High head pressure. High head pressures can be caused by clogged or dirty condenser coils or screens, an inoperative condenser fan. High head pressure requires the compressor to work harder, creating additional heat which ultimately can result in motor burnout. Poor ventilation around the condenser, and extremely high ambient temperatures can also cause motor failures.

Moisture in system. Leakage of air into the refrigeration system starts a chain reaction which can result in motor burnout. Air contains oxygen and moisture which combine with refrigerant gas to form hydrochloric and hydrofluoric acids. These combine with compressor oil to form an acid sludge which is distributed throughout the system, and which attacks the motor windings, causing short circuits and burnout.

Diagnosing Compressor Motor Burnout

It is important to diagnose the type of compressor motor failure for two reasons. Simple failure, without motor burnout, does not require the extensive cleaning of the entire refrigeration system that burnout requires. Also, motor burnout indicates other problems which will lead to the failure, and these must be

charge port to drain a small quantity of oil into a glass container. If the oil is clean and clear, and does not have an acrid smell, the compressor did not burn out because of motor burnout. If the oil is black, contains sludge and has an acrid odor, the compressor did burn out because of motor burnout, and the refrigeration system must be cleaned to prevent residual contaminants from causing repeated burnouts when the compressor is replaced.

6-14. Cleaning Out The Refrigeration System After Burnout

You must clean the entire refrigeration system after a burnout has occurred, since contaminants will have been carried to many corners and restriction points in piping and fittings. These contaminants will seal the system with new refrigerant gas and compressor oil to prevent repeated burnouts. To clean the system thoroughly, act as follows:

a. Remove the filter-drier, and blow down the entire refrigeration system. To do this, connect a cylinder of dry nitrogen to each filter-drier, turn, in turn, and open the cylinder shutoff valve for at least 30 seconds at 50 psig (3.5 kg/cm²) pressure.

b. Connect the two filter-drier fittings with a locally manufactured from refrigerant tubing, and install a pump, reservoir and filter between the compressor. (See figure 6-2).

c. Disassemble both expansion valves and temporarily remove the valve cages. Re-install the power assembly, using a locally manufactured bracket between power assembly and body to prevent leakage. Tag and retain valve cages for use at re-assembly.

NOTE

An unused filter-drier or other suitable medium may be used as the filter.

d. Fill reservoir with fluorocarbon refrigerant and start the pump. Continue filling the reservoir with refrigerant, R11, until it begins to pour out of the return line. Continue flushing for at least 15 minutes.

NOTE

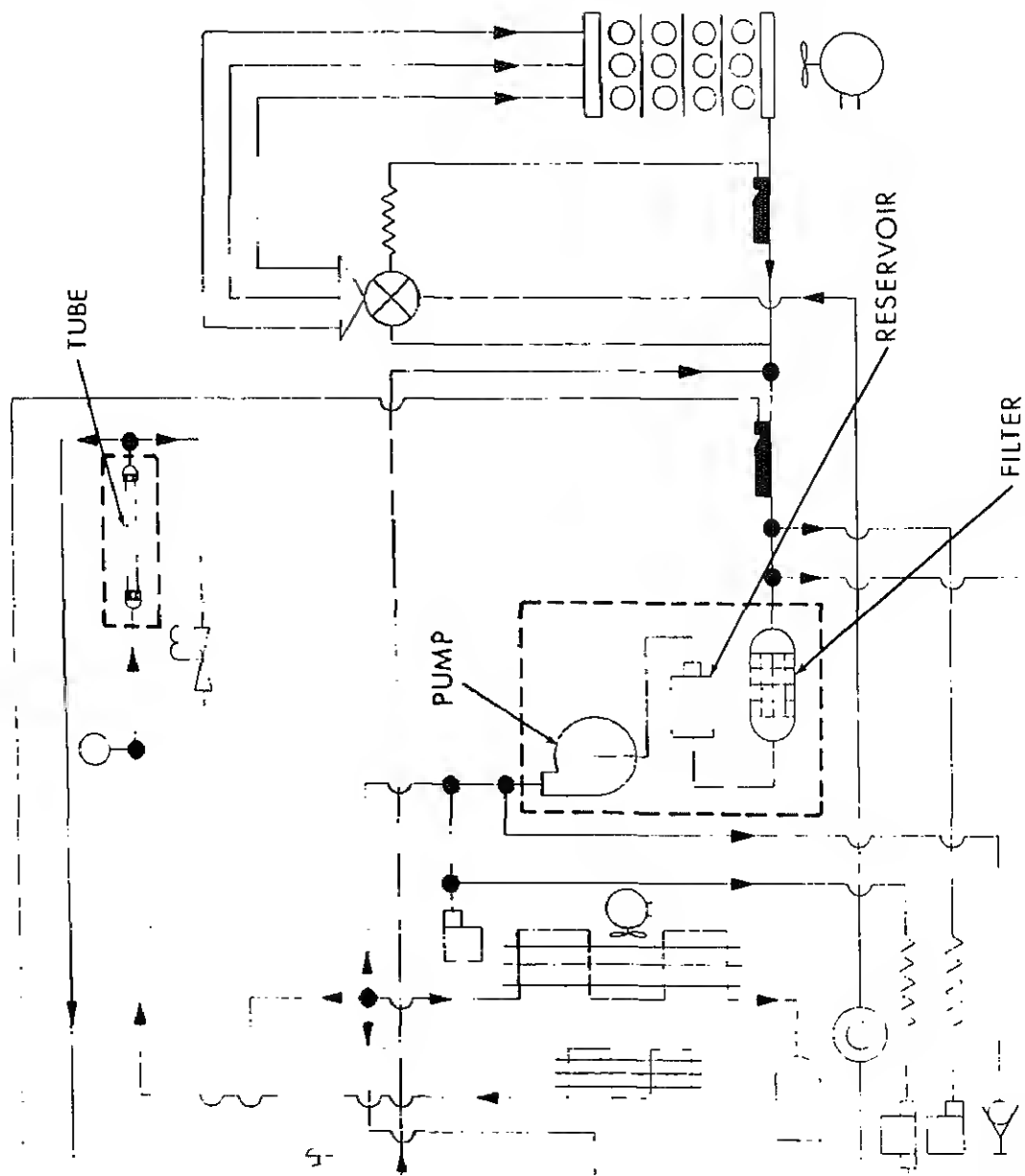
During flushing and back-flushing operations, apply 24 volts, dc, to the bypass line solenoid valve for a total of approximately 10 minutes of each cycle. This will ensure that the cleaning solvent is forced through

e. Reverse the pump connections, replace the filter with a new filtering medium, and back-flush the system for an additional 15 minutes.

f. Remove the pump, reservoir, filter and filter-drier jumper. Place an empty container below the compressor connections, and connect a cylinder of dry nitrogen to each filter-drier connection in turn. Blow down each leg of the system at 50 psig (3.5 kg/cm²) for at least 30 seconds.

g. Disassemble both expansion valves, the valve cages. Install new gaskets, and valves, making sure that projections are in notches in valve bodies.

h. Disconnect the dry nitrogen cylinder, immediately install a new filter-drier, making sure the direction-of-flow arrow points up. Reconnect compressor connections if compressor is installed immediately.



Description

The pressure switch is a SPST switch which is connected in parallel with the manual two-speed fan switch on the control panel. Its function is to connect power to the auxiliary windings of the two-speed fan motor when system pressure increases to a preset level. The increased fan speed, and the resulting increase in airflow around both the condenser and the evaporator coils has a tendency to decrease system pressure, which limits it to a safe and efficient level. The pressure switch is connected in parallel with the manual two-speed fan switch; it functions only when the manual switch is set at LO SPEED and the air conditioner is operating in the cooling mode. The pressure switch is connected to the refrigeration system at a tee fitting on the discharge side of the compressor. It closes at a pressure of 400 ± 16 psi (28.12 \pm 1.12 kg/cm²), and opens at a pressure of 350 ± 16 psi (24.6 \pm 1.12 kg/cm²).

Removal

Remove the pressure switch from the air conditioner in accordance with the following directions: Remove five screws from the frame of the fresh air damper screen, and remove the screen.

Refer to figure 8-2 for identification of service ports. Remove the cap from the suction service port, and connect a hose of sufficient length to vent the refrigerant gas to a safe area, preferably outdoors. Crack valve open to release refrigerant for a period of 5-6 hours. Too rapid discharge will cause oil to be blown out of the system.

WARNING

Use great care to avoid contact with liquid refrigerant or refrigerant gas being discharged under pressure. Sudden and irreversible tissue damage can result from freezing. Wear thermal protective gloves and a face protector or goggles in any situation where skin or eye-contact is possible.

Prevent contact of refrigerant gas with flame or hot surfaces. Heat causes the refrigerant to break down and form carbonyl chloride (phosgene), a highly toxic and corrosive gas.

c. Unscrew the two panel fastener screws in the center of each panel, and remove the panel from the lower panel, and remove the panel.

d. Unfasten six cam-lock stud fasteners from the evaporator intake grille by turning them clockwise. Remove the grille and the air filter.

e. Disconnect the wiring harness plug from the receptacle on the left end of the control panel assembly.

f. Remove four screws from the corners of the control panel mounting flanges.

g. Remove the screw from the loop clamp holding the thermostat sensor bulb to the wall of the evaporator air intake chamber. Withdraw the control panel assembly from the air conditioner while carefully leading the thermostat sensor bulb and capillary tube through the grommet and hole in the floor of the evaporator take chamber.

h. Loosen the setscrew in the end of the core reset cable on the circuit breaker reset cable. Straighten the end of the cable, and slide off the core end fitting.

i. Remove two screws, and remove two loop clamps holding the circuit breaker reset cable to the junction box. Remove the reset cable from the actual connector plate.

j. Lean the junction box outward, and disconnect the two wiring harness plugs from the rear.

k. From connector plug, P3, which has been disconnected from the junction box, unsolder wiring pins O and g. Release or cut wire ties, and separate wires from cable.

WARNING

Do not perform the following step until all refrigerant has been discharged from the system.

l. Using a wrench on each hex (pressure switch tee fitting) remove the pressure switch.

7-3. Inspection/Test

Inspect the pressure switch for physical damage or broken wires or missing insulation. Repair or replace as needed. Test the pressure switch as directed in the following procedure:

a. Connect an ohmmeter, multimeter or other continuity testing device to the wire leads of the

and other contaminants could be carried into the refrigeration system.

b. Connect a cylinder of dry nitrogen to the body of the pressure switch, and slowly pressurize the switch.

c. Observe the pressure gauge and the meter of the continuity tester. Continuity should be indicated when pressure reaches 400 ± 16 psi (28.12 ± 1.13 kg/cm²).

d. Gradually reduce pressure to the switch while observing the pressure gauge and the continuity tester. Continuity should drop out at 350 ± 16 psi (24.6 ± 1.13 kg/cm²).

e. Replace the pressure switch if it does not meet pressure and continuity requirements.

7-4. Installation

Install the pressure switch in the air conditioner in accordance with the following instructions:

a. Slide a one inch long piece of heat-shrink tubing over each wire lead of the switch, and connect wire leads to pins O and g of connector plug, P3. Solder connections, slide heat-shrink tubing over connection, and use a match or other heating device to shrink tubing onto connection.

b. Connect switch body to tee fitting, using two wrenches to tighten flare nut on switch.

c. Replace filter-drier (dehydrator) as directed in the following procedure:

(1) Unscrew flare nuts from top and bottom connections of the filter-drier.

(2) Remove the screw holding the band clamp to the casing and remove band clamp and filter-drier.



Do not remove caps from the connections of a new filter-drier until ready to connect system tubing.

(3) Place band clamp on a new filter-drier in such a position that the direction-of-flow arrow will point up when installed. Attach the filter-drier and band clamp to the casing with the screw previously removed, or equivalent.

(4) Connect tubing to top and bottom of the filter-drier with the flare nuts on the tubing.

d. Leak-test the refrigeration system in accordance

7-5. Final Assembly

After successful completion of previous steps, close both service valves, remove gauges, and install caps on valves. Assemble unit as follows:

a. Install the junction box as directed in the following procedure:

(1) Connect electrical wiring harness to the receptacles on the rear surface of the junction box.

(2) Insert the end of the circuit breaker cable through the hole in the actuator plate, and install core-end fitting on end of cable.

(3) Attach circuit breaker reset cap to the junction box with two loop clamps and screws. Tighten 1/4 inch of the cable sheath extend beyond the loop clamp.

(4) Install the junction box in the rear of the air conditioner by securing the mounting flanges to the rear panel with four panel fastener screws.

(5) Adjust the circuit breaker lever to the "ON" position by pressing the core end fitting by pressing the lever down, and pressing the actuating knob. Position the core end fitting 0.12-0.25 inch below the connector plate. Bend the end of the cable at right angles.

b. Install the control panel assembly on the air conditioner in the following manner:

(1) Carefully uncoil the capillary tube, install the temperature control thermostat, and lead the tube through the hole and grommet in the rear of the intake chamber. Secure the sensor with a band clamp and screw.

(2) Secure the control panel assembly to the rear of the air conditioner with four screws through the corners of the rear panel flange.

(3) Connect wiring harness plug to the rear of the control panel assembly on the left end of the control panel assembly.

c. Insert the air filter into the rear of the air conditioner and install retaining strip, then position the grille on the air conditioner. Secure the grille with cam-lock studs clockwise.

d. Install the lower panel on the rear of the air conditioner and secure it with the two panel fasteners on the upper edge.

e. Evacuate and charge the system in accordance with paragraphs 6-9 and 6-10. Pressure test the system in accordance with paragraph 6-11.

f. Close service valves and remove

Description

The high-pressure and the low-pressure cutout switches are protective devices which interrupt electrical power to the compressor whenever refrigerant pressure becomes too high or too low to permit efficient operation. The pressure connections to switches are made by means of capillary tubes to discharge side and suction side of the compressor. Electrically, the two switches are connected in series between the mode selector switch and the compressor. The switches are equipped with manual reset buttons. The pressure cutout switches are located next to the fresh air inlet screen on the back of the air conditioner.

Preliminary Check

Check electrical operation of the pressure cutout switches in the following manner.

With the air conditioner operating in the cooling mode, install a yoke-type ammeter around the power supply cable. Note the reading.

Press then release each of the pressure cutout buttons while watching the ammeter. The ammeter reading should drop when each reset button is pressed, and return to its original reading when the button is released.

If the ammeter does not respond when each button is pressed and released, replace the proper pressure cutout switch.

Removal

Remove the pressure cutout switches from the air conditioner as indicated below:

WARNING

Disconnect power from the air conditioner before performing maintenance on the electrical system. The voltage used can be lethal.

Remove five screws from the frame of the fresh air screen, and remove the screen.

Discharge all refrigerant from the system in accordance with the following instructions:

1) Refer to figure 8-2 for identification of service valves. Remove caps from both service valves, and connect a hose of sufficient length to the refrigerant gas to a safe area, preferably out-

2) Remove 18 screws and washers from the edges of the fabric cover, and remove the cover.

d. Remove 15 screws and packing washers from the top surface of the top panel, and five screws from the rear flange. Remove the top panel.

e. Unscrew two panel fastener screws from the outer edge of the lower panel. Remove the lower panel.

f. Release six cam-lock studs in the frame of the intake grille by turning them clockwise. Remove the grille. Remove two screws and the retaining strap from the right edge of the air filter, and remove the filter.

g. Remove the control panel assembly from the air conditioner as follows:

(1) Disconnect and remove the wiring harness plug from the left end of the control panel assembly.

(2) Remove the screw and loop clamp which attaches the temperature control thermostat sensor bulb to the wall of the air intake chamber.

(3) Remove four screws from the corners of the control panel mounting flange.

CAUTION

Be careful to avoid kinking the capillary tube when removing the thermostat sensor bulb.

(4) Withdraw the sensor bulb and capillary tube through the hole and grommet while removing the control panel assembly from the air conditioner. Carefully coil the capillary tube, and tape it to the cavity in the control panel to protect it from damage.

h. Remove the junction box from the air conditioner as directed below:

(1) Loosen the setscrew in the end of the circuit breaker reset cable end fitting. Straighten the cable, and remove the end fitting.

(2) Remove two loop clamps and screws from the circuit breaker reset cable, and remove the cable from the actuator arm connector plate and the junction box.

(3) Unscrew the four panel fastener screws from the mounting flanges of the junction box. Remove the mounting brackets in the air conditioner.

(4) Pull the junction box forward, and disconnect the wiring harness connector plug from the receptacles on the rear of the junction box. Remove the junction box from the air conditioner.

charged from the system. Escaping refrigerant gas under pressure can cause permanent tissue damage from sudden freezing.

j. Both pressure cutout switch connections to the refrigeration system are located near the compressor, the low-pressure cutout switch in a cross-fitting in the suction line, and the high-pressure switch in a tee fitting (across from the pressure control switch) in the discharge line. Use a wrench on each side of the joint, and unscrew both pressure cutout switch connections.

k. Carefully withdraw pressure cutout switch housing from the top of the air conditioner, leading capillary tubes and electrical wires out as the housing is withdrawn.

7-9. Disassembly

Disassemble the pressure cutout switches and housing as directed below: (See figure 7-1.)

a. Remove four screws in the end of the housing, and remove both pressure cutout switches. Be careful to avoid kinking the capillary tubes when removing them from the notches in the edge of the housing.

b. Pry off spring clip on end of pressure cutout switch, and remove the spring clip and the cover from the wire connections. Disconnect wires as necessary.

7-10. Inspection/Test

Inspect the housing for physical damage and deformation. Replace if necessary. Inspect the pressure cutout switches for breakage or missing parts. Test the switches as follows:

a. Connect the high-pressure cutout switch to an ohmmeter, multimeter or other continuity testing device.



Do not use compressed air for testing the pressure cutout switches. Oil, moisture and other impurities could be carried into the refrigeration system.

b. Connect the capillary flare nut to a cylinder of dry nitrogen, and slowly pressurize the switch assembly.

c. When pressure gauge indicates 415 psig (29.17 kg/cm²) press and release reset button. Continuity

0.7 kg/cm²) and press reset button. Continuity should be indicated.

f. Connect the low-pressure cutout switch to a continuity tester and the source of dry nitrogen as directed in steps a and b above.

g. Slowly pressurize the switch to 29.17 kg/cm² and press reset button. Continuity should be indicated.

h. Continue to pressurize the switch to 415 psig (29.17 kg/cm²). Continuity should be indicated times.

i. Slowly reduce pressure. Continuity should be indicated out at 7 ± 5 psig (0.5 ± 0.35 kg/cm²).

j. If pressure-continuity requirements are not met, replace the pressure cutout switch.

7-11. Assembly

Assemble the pressure cutout switch housing as follows:

a. Install a 7/16-inch grommet in the end of the housing. Cement in place. Lead capillary tubes through the hole in the grommet.

b. With terminal covers removed from the pressure cutout switches, connect the short lead from terminal 1 of the high-pressure switch to terminal 1 of the low-pressure switch.

c. Connect wire leads to terminal 2 of the high-pressure switch and to terminal 1 of the low-pressure switch. Tag the leads for identification. Remove terminal covers and retaining clips.

d. Install a split grommet on both ends of the housing and insert the low-pressure cutout switch into the upper part of the housing. Secure with two screws. Install capillary tube along the back and corner of the housing, connecting to the left-hand notch. Tag connecting end for identification.

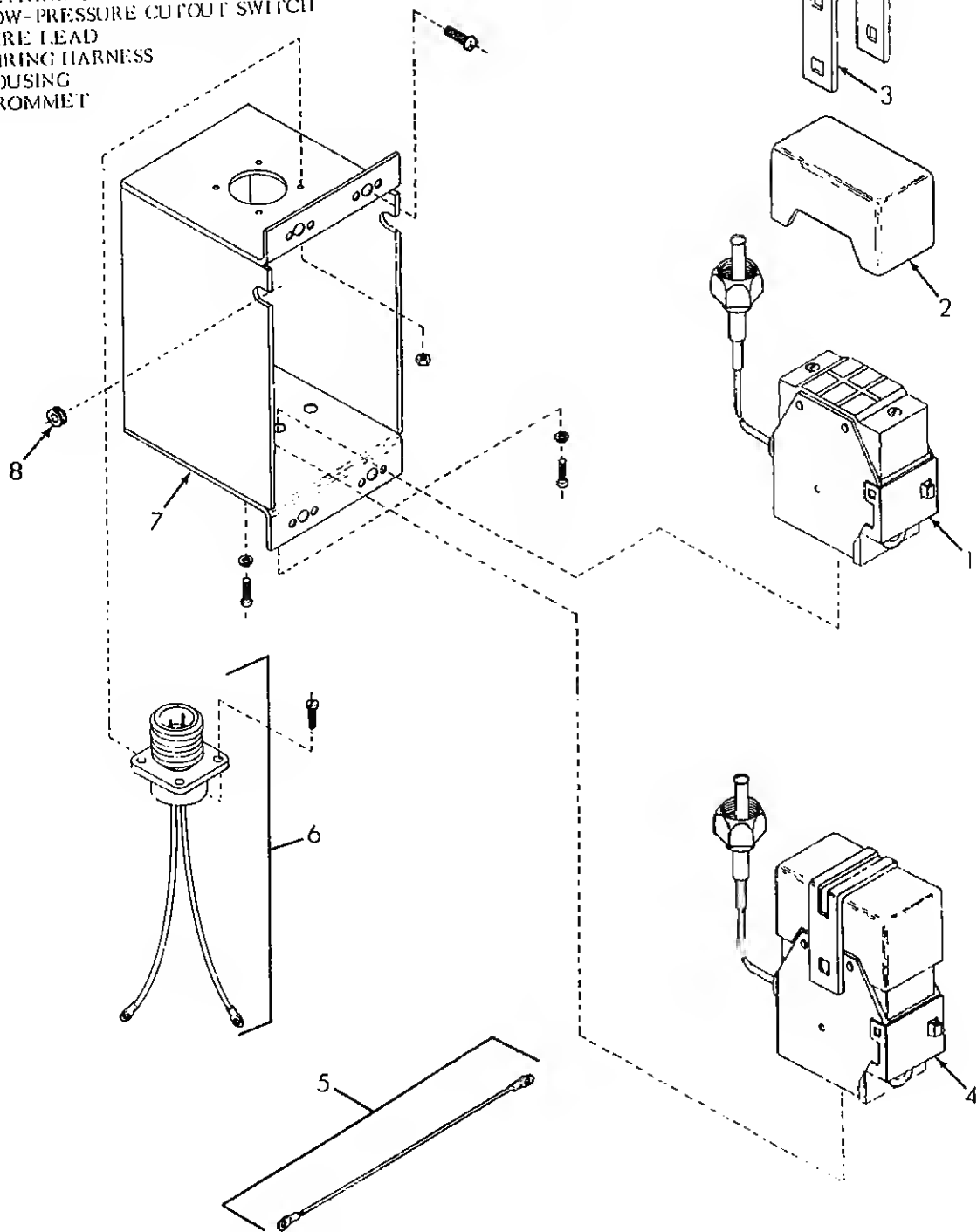
e. Insert the high-pressure cutout switch into the upper part of the housing. Lead capillary tube along the corner and to remaining notch. Secure with two screws. Install capillary tubes and retainers in the notches. Tag connecting end for identification.

7-12. Installation

Install the pressure cutout switches in the air conditioner as directed in the following steps:

a. Carefully lead ends of the wire leads and capillary tubes down inside the back of the air conditioner while placing the switch housing in the air conditioner. Secure the housing with four screws through the back of the housing.

HIGH-PRESSURE CUTOFF SWITCH
CLIP
RETAINING CLIP
LOW-PRESSURE CUTOFF SWITCH
WIRE LEAD
WIRING HARNESS
HOUSING
GROMMET



ting in the suction line to the compressor, hand tight. Using two wrenches, one on each side of the joint, tighten the connections.

c. Tape or wire-tie wire leads to the wiring harness bundle. Coil slack capillary tubing into 3-inch or larger coils, and tape to a nearby tube or other support.

d. Replace filter-drier (dehydrator) as directed in the following procedure:

(1) Unscrew flare nuts from top and bottom connections of filter-drier.

(2) Remove the screw holding the band clamp to the casing, and remove band clamp and filter-drier.

CAUTION

Do not remove caps from the connections of a new filter-drier until ready to connect system tubing.

(3) Place band clamp on a new filter-drier in such a position that the direction-of-flow arrow will point up when installed. Attach the filter-drier and band clamp to the casing with the screw previously removed, or equivalent.

(4) Connect tubing to top and bottom of the filter-drier with the flare nuts on the tubing. Use a back-up

strut in paragraph 6-8.

f. When the system has been tested for leaks, install the junction box and assemblies as instructed in paragraph 6-10.

g. Install grilles, panels and fabric cover in the following procedures:

(1) Place top panel in position on the conditioner. Secure with 15 screws and washers on top, and five screws on the bottom flange.

(2) Fit the fabric cover to the top of the conditioner, and adjust until eyelets match the holes. Secure with 18 screws and washers.

(3) Insert the air filter into the top of the conditioner and clip, then position the air intake grille on the conditioner. Secure it by turning the fasteners clockwise.

(4) Install the lower panel on the bottom of the conditioner and secure it with the two panel fasteners on the upper edge.

h. Evacuate and charge the refrigerant system as directed in paragraphs 6-9 and 6-10. Test for leaks indicated in paragraph 6-11.

i. Close service valves, and remove the caps on valves. Install fresh air filter on the top with five screws.

Section I. REFRIGERANT TUBING AND FITTINGS

Description

Refrigerant tubing is seamless copper which has a smooth internal finish to permit thorough cleaning and prevent entrapment of moisture or other impurities. Both rigid and soft grades are used, depending upon whether the tubing is to be bent or is to remain straight. Sharp changes of direction are accomplished by the use of fittings, such as elbows, tees and crosses. Connections are made by silver soldering or brazing, or by flare fittings.

Inspection/Test

Inspect tubing and fittings visually for nicks, cuts, cracks or kinks. If damage appears to be minor, test for leaks. (Refer to paragraph 6-8.) If no leaks are detected, consider the tubing serviceable.

Removal/Installation

General. The refrigeration system must be completely discharged before removing any part of the system. If debrazing is required for removal, a flow of pumped dry nitrogen must be introduced through the system before the joint is heated to brazing temperature. Any refrigerant gas, air or moisture in the system would cause serious corrosion at brazing or brazing temperature.

Heating. Sufficient heat should be applied uniformly around the joint to reach the melting point of the filler metal quickly. Slow or non-uniform heat permits heat to be conducted away from the joint, sometimes melting an adjacent joint at the same time as the one intended.

Cleaning. Residual filler metal can be removed from a debrazed tube in the following manner.

WARNING

Wear welders gloves or other thermal protective gloves when performing the following operation.

(1) Fold a piece of fiber-glass cloth about 12 inches and wrap it loosely around the tubing about 12 inches away from the tubing end to be cleaned.

(2) Heat the tubing at the end to be cleaned until the braze filler metal is thoroughly melted.

(3) Grasp the fiber-glass wrapping firmly and pull it over the tubing end with a twisting motion. *d. Protection from heat.*

WARNING

Polyurethane foam insulation breaks down to form toxic gases when heated to brazing temperature.

(1) When brazing/debrazing refrigerant tubing and fittings near an insulated wall of the air conditioner, fabricate a sheet metal shield to deflect the heat of the torch away from the insulation. Perform the operation in a well ventilated area.

(2) When brazing/debrazing tubing from expansion valves, solenoid valves or other components, the component could be warped or damaged by brazing temperature. The component should be disassembled to the extent possible, and the body alone brazed/debrazed. If assembly is impractical or impossible, the entire component, except for the joints to be heated, should be wrapped in wet cloth to act as a heat sink.

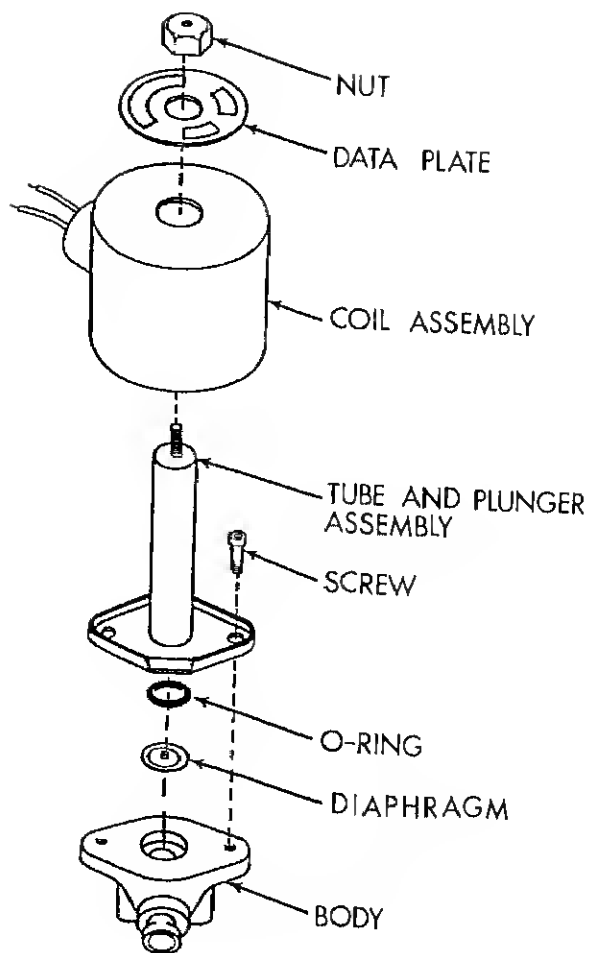
Section II. SOLENOID VALVES

Description (See figure 8-1).

Two solenoid valves are used in the air conditioner, one to close/open the liquid refrigerant line from the condenser coil to the evaporator coil expansion valve, and the other to close/open the pressure equalization circuit.

The filter-drier in the lower part of the unit, while the pressure equalizer solenoid valve is located in the rear part of the air conditioner.

8-5. Access



wise. Remove the grille. Remove two screws from the air filter retainer and remove the air filter.

WARNING

Disconnect power from the air conditioner before performing maintenance on the electrical system. The voltage used can be lethal.

(3) Disconnect the wiring harness plug from the receptacle on the left end of the control panel assembly.

(4) Remove four screws from the corners of the control panel mounting flanges.

(5) Remove the screw and loop clamp holding the thermostat sensor bulb to the wall of the evaporator take chamber. Withdraw the control panel assembly from the air conditioner while carefully leading the thermostat sensor bulb and capillary tube through the grommet and hole in the floor of the intake chamber.

(6) Loosen the setscrew in the end of the core end fitting on the circuit breaker reset cable. Straighten the end of the reset cable, and slide the core end fitting over the cable.

(7) Remove two screws and loop clamps attaching the circuit breaker reset cable to the junction box. Remove the cable from the hole in the actuator arm of the selector plate.

(8) Unscrew four panel mounting screws from the control panel mounting flanges of the junction box.

(9) Lean the junction box outward, and disconnect the two wiring harness plugs from the receptacles on the back of the junction box. Remove the junction box from the air conditioner.

Gain access to the pressure equalizer solenoid valve as directed in the following procedure:

(1) Remove 18 screws and washers from the four corners of the fabric cover, and remove the cover from the air conditioner.

(2) Remove 15 screws and packing washers from the top of the panel, and five screws from the rear of the panel. Remove the top panel.

Inspection/Test

Inspect the solenoid valves visually for physical damage, loose connectors, loose coil and housing and frayed or frayed wires or missing insulation. Test operation by applying 24-28 volts dc to the pins of the

testing or troubleshooting, replace the diaphragm and O-ring, or if valve body is damaged, replace the entire valve, as necessary.

8-7. Coil Replacement

a. Removal. Remove the coil assembly in accordance with the following instructions: (See figure 8-7.)

(1) Disconnect wiring harness plug from the receptacle.

(2) Remove nut and data plate from top of coil assembly, and lift off coil assembly.

b. Installation. If electrical connector is serviceable, transfer it to a new coil assembly, and install the coil assembly on the solenoid valve as follows:

(1) Place coil assembly over tube and plug into assembly, and position data plate on coil assembly. Secure with nut.

(2) Retest plunger operation by applying 24-28 volts dc to pins A and B of receptacle. If no click is heard, replace the tube and plunger assembly, diaphragm and O-ring, or if valve body is damaged, replace the entire valve assembly.

(3) If a click is heard when 24-28 volts dc is applied to the solenoid coil, connect the wiring harness electrical plug.

8-8. Valve Replacement

If it is necessary to replace the tube and plunger assembly, diaphragm and O-ring, or the entire valve, proceed as directed in the following procedure:

a. Disassembly. Disassemble the solenoid valve as follows:

CAUTION

All gas must be discharged from the refrigeration system before the system is opened for maintenance.

(1) Remove five screws from the fresh air intake panel and remove the screen to gain access to the refrigeration service valves.

(2) Refer to figure 8-2 for identification of the service valves. Attach a hose of sufficient length to carry refrigerant gas to a safe area, preferably outdoors, to the suction service valve. Crack the valve open slightly to discharge refrigerant gas for a period of 5-6 hours. Too rapid discharge will cause oil to be blown out of the system.

(3) Remove coil assembly as directed in paragraph 8-7.

parts. If valve body is warped or is otherwise unacceptable, connect a cylinder of dry nitrogen to the charge service valve, and establish a flow of 1-2 (0.1 - 0.2 M³/min) through the system. Debraze valve body from the refrigerant tubing.

(6) Remove two mounting screws attaching the valve body to the mounting bracket. Remove the non-ferrous valve body.

Assembly. If valve body was removed, install new one, secure to mounting bracket with two screws, attach piping connections to body, disassembled in remainder of valve. Proceed as follows:

(1) Wrap the body between the tubing connection with wet cloth, and start a 1-2 cfm (0.1 - 0.2 M³/min) of dry nitrogen through the system. Braze connections. When cool, remove cloth and continue assembly.

(2) Install O-ring in groove in tube and plunger assembly, and place diaphragm in recess in valve body with the metal buffer plate and seat on top.

(3) Carefully place tube and plunger assembly on the body, and secure with two screws. Tighten uniformly.

(4) Install coil assembly as instructed in paragraph 8-7b.

(5) Install a new filter-drier, and leak test as directed in paragraph 8-8.

Final Assembly

Assemble the air conditioner, evacuate and charge in accordance with the following procedure:

Install the top panel, and secure with 15 screws and packing washers in the top surface and five screws in the rear flange.

Fit fabric cover onto back of air conditioner, and secure with 18 screws and washers.

Install the junction box in the air conditioner as follows:

(1) Connect the two wiring harness plugs to their respective receptacles in the rear surface of the junction box.

(2) Position the junction box against the mount-

ing plate, and secure with two screws. Tighten setscrew temporarily to retain cable in place.

(4) Place two loop clamps over the cable sheath and attach them to the junction box with two screws. Leave at least 1/4 inch between lower edge of bottom loop clamp and end of cable sheath.

(5) Adjust core end fitting so that 0.12-0.25 (3-6 mm) of clearance is left between the bottom of the connector plate and the core end fitting when the circuit breaker handle is down and the reset cable is extended. Bend 0.12 - 0.25 inch (3-6 mm) of the end of the cable 90 degrees.

d. Install the control panel assembly as directed in the following steps:

(1) Carefully push the temperature control thermostat sensor bulb through the hole and grommet in the floor of the air intake chamber while positioning the control panel assembly on the junction box. Attach the sensor bulb with a loop clamp and screw.

(2) Mount the control panel assembly on the junction box and secure with four screws through the corners of the mounting flange.

(3) Connect wiring harness plug to receptacle at left end of control panel assembly.

(4) Install air filter in retaining channel in retaining bracket. Tighten two screws in retaining bracket. Position air intake grille on air conditioner, and secure by turning the six cam-lock studs clockwise.

(5) Install the lower panel on the air conditioner and secure with two panel fastener screws in the rear edge.

(6) Purge the refrigeration system for 10 minutes with dry nitrogen, then evacuate and charge the system as directed in paragraphs 6-9 and 6-10.

(7) Pressure test the system in accordance with paragraph 6-11.

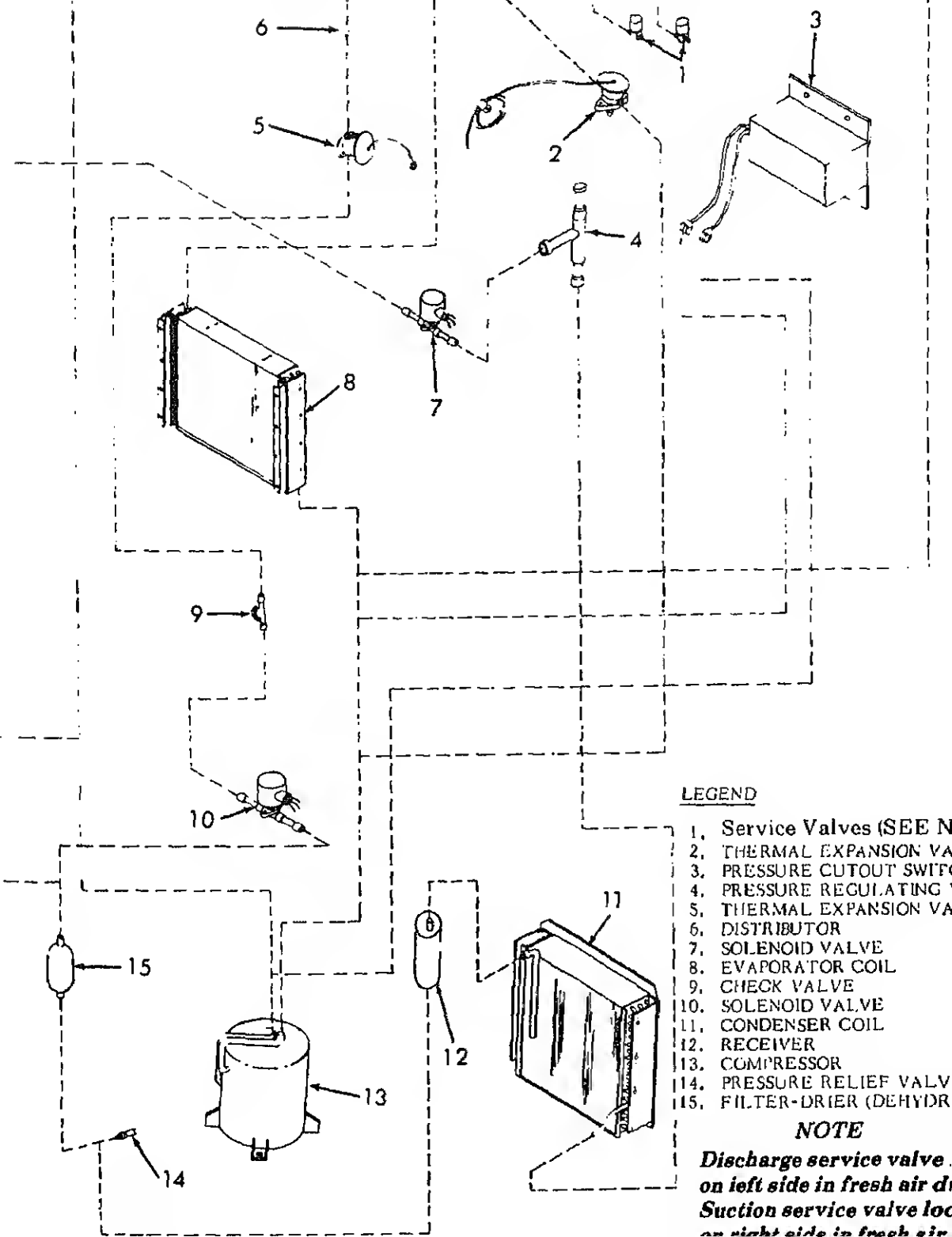
(8) Close both service valves, remove gauges, and place caps on valves. Position fresh air screen on air conditioner, and secure with five screws.

Section III. FILTER-DRIER (DEHYDRATOR)

8-10. Description (See figure 8-2).

The filter-drier assembly is a metal container which contains dehydrating and filtering media through which the liquid refrigerant must flow from the con-

pressor has been opened. The filter-drier is located above and to the right of the compressor in the lower part of the air conditioner. It is connected to the refrigerant



LEGEND

1. Service Valves (SEE N
2. THERMAL EXPANSION VA
3. PRESSURE CUTOFF SWITC
4. PRESSURE REGULATING V
5. THERMAL EXPANSION VA
6. DISTRIBUTOR
7. SOLENOID VALVE
8. EVAPORATOR COIL
9. CHECK VALVE
10. SOLENOID VALVE
11. CONDENSER COIL
12. RECEIVER
13. COMPRESSOR
14. PRESSURE RELIEF VALV
15. FILTER-DRIER (DEHYDR

NOTE

Discharge service valve
on left side in fresh air d
Suction service valve loc
on right side in fresh air

Unscrew two panel fastener screws in the upper of the lower panel and remove the panel.

Dismount the air intake grille by turning the six lock fasteners counter-clockwise. Remove the e.

Remove the control panel assembly as follows:

(1) Disconnect wiring harness plug from receptacle at left end of control panel assembly.

(2) Remove four screws from the corners of the mounting flanges of the control panel.

(3) Remove a screw from the loop clamp holding temperature control thermostat bulb, and remove loop clamp.

(4) Withdraw the control panel assembly from air conditioner while carefully leading the sensor and capillary tube through the grommet and

Remove the junction box assembly from the air conditioner in the following manner:

(1) Loosen the setscrew in the end of the core end fitting on the circuit breaker reset cable. Straighten end of the cable, and remove the core end fitting.

(2) Remove two screws from two loop clamps holding the circuit breaker reset cable, and remove the e from the junction box.

(3) Unscrew two panel fasteners from each of the mounting flanges at the ends of the junction box.

(4) Lean the junction box forward, and disconnect the two wiring harness plugs from the receptacles on the back of the junction box. Remove the junction box from the air conditioner.

g. Removal

Remove the filter-drier from the air conditioner as directed in the following procedure:

WARNING

All refrigerant gas must be discharged from the system before proceeding with the removal of the filter-drier.

Discharge refrigerant as directed in paragraph 6-6.a. When all refrigerant has been discharged, remove one screw from the outside of casing, that holds the filter-drier band clamp.

Unscrew the tubing flare nuts from the top and bottom connections of the filter-drier. Remove the filter-drier and band clamp.

following instructions:

a. Install a new filter-drier in the band clamp in such a way that the direction-of-flow arrow will point up when installed.

b. Install the filter-drier and band clamp in the air conditioner, and secure with the screw removed previously. Check again to be sure that the direction-of-flow arrow is pointing up.

c. Connect refrigerant tubing to the flare fittings at the top and bottom of the filter-drier.

d. Leak-test in accordance with paragraph 6-6.b.

e. Install the junction box as directed below:

(1) Connect the two wiring harness plugs to the proper receptacles on the back of the junction box.

(2) Attach the junction box to the mounting brackets in the air conditioner with two panel fasteners in each end.

(3) Insert the end of the circuit breaker reset cable in the hole in the connector plate, and slide the core end fitting over the end of the cable. Tighten the setscrew to retain cable in place temporarily.

(4) Place two loop clamps on the reset cable sheath, and attach them to the junction box with two screws. Leave at least 1/4 inch of sheath extending below the lower loop clamp.

(5) Adjust the core end fitting to provide 0.12-0.25 inch (3-6 mm) clearance between the connector plate and the core end fitting when the circuit breaker reset cable is down and the reset cable is fully extended.

f. Install the control panel assembly in accordance with the following instructions:

(1) Uncoil the temperature control thermostat capillary tube, and lead the sensor bulb through the hole in the grommet in the floor of the air intake chamber as you position the control panel assembly on the junction box.

(2) Secure the control panel to the junction box with four screws through the corners of the mounting flange. Secure the thermostat sensor bulb to the side of the air intake chamber with a loop clamp and screw.

g. Replace panels and grilles as follows:

(1) Install air filter in retainer and spring retainer. Then install the air intake grille on the front of the air conditioner. Secure by turning six cam-lock fasteners clockwise.

(2) Install the lower panel, and secure with two panel fastener screws in the upper edge.

Remove gauges, and replace caps on service

Section IV. SIGHT-GLASS LIQUID INDICATOR

1. Description (See figure 2-2).

The sight-glass liquid indicator is a circular sealed window in the liquid side of the system between the liquid line solenoid valve and the evaporator coil expansion valve. The indicator is located on the rear face of the air conditioner, below the pressure cutout switches.

2. Inspection

Visually inspect the sight-glass liquid indicator for physical damage, cracked or broken sight-glass or other defects.

3. Access

Before removing the sight-glass liquid indicator from the refrigeration system, the system must be completely discharged. Proceed as follows:

Remove five screws from the fresh air screen, and move the screen.

Refer to figure 8-2 for identification of service valves. Connect a hose of sufficient length to carry refrigerant gas to a safe place, preferably outside, to the suction service valve. Crack the valve open to discharge gas over a period of 5-6 hours. Too rapid discharge will cause oil to be blown out of the system.

While waiting for the system to discharge, remove panels and grilles as follows:

(1) Remove 18 screws and washers from the four corners of the fabric cover, and remove the fabric cover.

(2) Remove 15 screws and packing washers from the top surface of the top panel, and five screws from the rear flange. Remove the top panel.

(3) Remove the air intake grille by turning six lock studs clockwise. Remove the air filter by moving two screws from the retainer and pulling out the filter.

(4) Unscrew two panel fastener screws in the upper edge of the lower panel, and remove the panel.

Remove the control panel assembly and the junction box in accordance with paragraph 8-11.

Remove the four screws from the ends of the pressure cutout switch housing, and move the housing

aside to permit access to the sight-glass liquid indicator.

8-17. Removal

Remove the sight-glass liquid indicator from the air conditioner as follows:

WARNING

All refrigerant gas must be discharged from the system, and a flow of dry nitrogen connected to the discharge service valve before removing the sight-glass.

a. Remove two screws and lockwashers from the sides of the bracket, and remove the bracket spacer from inside the air conditioner.

b. With dry nitrogen flowing through the system, debraise joints of the sight-glass liquid indicator, and remove the indicator from inside the air conditioner.

8-18. Installation

Install the sight-glass liquid indicator as directed in the following procedure.

a. Connect tubing to sight-glass, and place tubing between sight-glass and casing.

b. Place bracket over back of sight-glass assembly and secure through the casing with two screws and lockwashers.

c. With dry nitrogen flowing through the system at 1-2 cfm (0.1 - 0.2 M³/min), braze tubing joints to the sight-glass liquid indicator.

d. Leak-test as directed in paragraph 6-8.

8-19. Assembly

Assembly and charge the air conditioner in accordance with the following procedure:

a. Position the pressure cutout switch properly, and secure with four screws.

b. Install a new filter-drier, and complete assembly of the air conditioner as directed in paragraph 8-13.

below a preset level. When the valve opens, it passes refrigerant gas to the suction side of the compressor to prevent the formation of low suction pressures. If pressure testing indicates that the suction pressure is out of limits, adjustment of the pressure regulating valve will usually correct the trouble. The pressure regulating valve is located in the top of the conditioner, in front of the pressure equalizer orifice and liquid quench expansion valves.

1. Access

In order to adjust or to replace the pressure regulating valve, gain access to it as described below:

a. Remove 18 screws and washers from the four corners of the fabric cover, and remove the cover.

b. Remove 15 screws and packing washers from the surface of the top panel, and five screws from the top flange. Remove the top panel.

c. Remove five screws from the fresh air screen, and remove the screen.

2. Inspection/Test

Visually inspect the pressure regulating valve for physical damage. Test for proper operation of the valve by pressure testing the system in accordance with paragraph 6-11. If minimum suction pressure is out of limits, adjust the pressure regulating valve.

3. Adjustment

Adjust the valve by removing the knurled screw-cap from the top of the pressure regulating valve, and adjusting the internal screw while observing the suction pressure gauge. Turning adjustment clockwise raises the suction pressure. When the gauge indicates the proper suction pressure, replace the knurled screw-cap snugly on the valve.

4. Removal

WARNING

All refrigerant gas must be discharged from the system before removing the valve.

the suction service valve. Crack the valve slightly to discharge the gas over a period of 5-6 minutes. Too rapid discharge will cause oil to be blown from the system.

NOTE

While discharging the system, you can remove additional panels and grilles, junction box and control panel assembly, which provide access to the filter-drier.

b. Remove the air intake grille by turning six lock studs clockwise. Remove the air filter by removing two screws in retainer and pulling out the filter.

c. Unscrew two panel fastener screws in the edge of the lower panel, and remove the panel.

d. Remove the control panel assembly and the junction box in accordance with paragraph 8-11.

e. Connect a cylinder of dry nitrogen to the charge service valve, and initiate a 1-2 cfm (0.05-0.1 M³/min) flow through the system.

f. Debraze the two tubing joints at the pressure regulating valve, and remove the valve.

8-25. Installation

Install the pressure regulating valve in the conditioner as follows:

a. Connect tubing ends to the valve, and bleed the system. Wrap valve in wet cloths to act as a heat sink.

b. Leak-test as instructed in paragraph 6-8.

c. Install a new filter-drier, and complete the assembly of the air conditioner as directed in paragraph 8-13.

relief valve, located on a tee fitting just below the filter-drier. The relief valve is preset at 540 ± 54 ($38 \pm 3.8 \text{ kg/cm}^2$). The valve is equipped with 1/4 - PTF Dryseal pipe threads so that it can be inserted into the tee.

Access

Obtain access to the pressure relief valve and the refrigeration service valves in accordance with the following instructions:

b. Remove the air intake grille by turning the lock studs counter-clockwise to release the grille. Remove two screws from the filter retaining strip. Remove the strip and filter.

c. Remove five screws from the fresh air screen and remove the screen.

d. Remove the control panel assembly as described below:

(1) Disconnect the wiring harness plug from the left end of the control panel assembly.

of the air intake chamber.

(4) Carefully lead the sensor bulb and capillary out through the grommet and hole while withdrawing the control panel assembly from the air conditioner.

Remove the junction box from the air conditioner as follows:

(1) Loosen the setscrew in the end of the core end fitting. Straighten the end of the circuit breaker reset cable, and remove the core end fitting.

(2) Remove the two screws and loop clamps securing the circuit breaker reset cable to the junction box, and withdraw the reset cable from the actuator connecting plate.

(3) Unscrew two panel fastener screws from the mounting flanges on each end of the junction box.

(4) Pull the junction box forward, and disconnect the two wiring harness plugs from the receptacles on the rear surface of the junction box.

Refer to figure 8-2 for identification of valves, proceed to remove the pressure relief valve as follows:

a. Connect a hose of sufficient length to the refrigerant gas to a safe area, preferably outside the suction service valve. Crack open the valve and charge refrigerant slowly, over a period of 5-10 minutes. Too rapid discharge will cause oil to be blown out of the system.

b. When all refrigerant gas has been discharged from the system, unscrew and remove the pressure relief valve. Use a back-up wrench to prevent damage to refrigeration system tubing.

8-29. Installation

a. Wrap Teflon pipe tape around the threads of the replacement pressure relief valve, and screw the valve into the tee. Use a backup wrench on the tee to prevent damage when tightening the valve.

b. Replace the filter-drier, and complete the assembly of the air conditioner as directed in paragraph 8-13.

Section VII. RECEIVER

Description (See figure 8-2.)

The receiver is a small cylindrical tank in the line between the condenser coil and the sub-cooler section of the condenser coil. Its function is to act as a reservoir for liquid refrigerant, which tends to stabilize the operation of the refrigeration system. The receiver is located on the left side of the air conditioner, just in front of the condenser coil.

Access

To gain access to the receiver, it is necessary to remove the lower panel and the compressor. (Refer to paragraphs 6-2 and 6-6.)

Removal

To remove the receiver from the air conditioner as indicated below:

Remove two screws and lock washers that secure the receiver support bracket from the outside of the casing.

With a flow of dry nitrogen connected to the discharge service valve, and the compressor discharge line capped or plugged to prevent escape of the

d. Loosen the clamping screw in the band clamp, and slide the clamp from the receiver.

8-33. Installation

Install the receiver as directed in the following procedure:

a. Place the receiver in the band clamp, and tighten the clamping screw finger tight.

b. Install the receiver, band clamp and support bracket into the air conditioner as a unit. Secure the support bracket with two screws and lock washers from outside the casing.

c. Make tubing connections from the condenser to the receiver, and tighten the clamping screw in the band clamp.

d. Restart the flow of dry nitrogen, and braze the joints to the receiver.

e. Install the compressor and a new filter-drier as directed in paragraph 6-7.

f. Leak-test in accordance with paragraph 6-8.

g. Install the junction box in accordance with the following instructions:

(1) Connect the two wiring harness plugs

the core end fitting over the end of the cable, and tighten the setscrew finger-tight.

(4) Install two loop clamps on the circuit breaker cable, leaving at least 1/4 inch of sheath below bottom loop clamp. Secure with two screws.

j. Pressure-test the system in accordance paragraph 6-11.

k. Close both service valves, remove gauges, and install caps on valves. Install fresh air screen, secure with five screws.

Section VIII. SYSTEM SERVICE VALVES

4. Description (See figure 8-2.)

Access to the internal refrigeration system is provided by the two system service valves, located just inside the fresh air screen. The valves are connection points for pressure and vacuum gauges, nitrogen for charging and leak-testing, and for charging refrigerant to the system.

5. Inspection/Test

Visually inspect the service valves for physical damage, broken chains and missing caps. Replace missing or broken parts or damaged valves. Test for leaks, both with caps snugly screwed on and with caps off, in accordance with paragraph 6-8. If leaks are detected with caps off, the valves are faulty. If leaks are detected with the caps on, the flare nut connections are probably faulty.

6. Removal

Remove the service valves from the air conditioner in accordance with the following instructions:

1. Remove five screws from the fresh air screen, and remove the screen.

2. Refer to figure 8-2 for identification of service valves, connect a hose of sufficient length to carry refrigerant gas to a safe place, preferably outside, to the suction service valve. Crack the valve open and discharge gas over a period of 5-6 hours. Too rapid discharge will cause oil to be blown out of the system.

WARNING

Make sure that all refrigerant gas has been discharged from the system before proceeding.

c. The inner end of each service valve is connected to the refrigeration piping with a flare nut. Disconnect by unscrewing the flare nut.

d. Two screws and lock washers hold each valve body to the floor of the fresh air intake chamber. Gain access to these screws by removing the condenser fan guard and impeller in the following manner.

(1) Remove eight screws and lock washers holding the rim of the condenser fan guard, and remove the fan guard.

(2) Loosen two setscrews in the hub of the condenser fan impeller, and pull off the impeller. Unscrew the jackscrews in the threaded holes in the face of the hub, if necessary to remove the impeller.

e. Remove two screws and lock washers from each service valve body, and remove the valve.

8-37. Installation

Install the system service valves in the air conditioner as directed in the following procedure:

a. Screw the flare nut onto the connecting end of the valve.

b. Install two screws in each valve body through the floor of the fresh air chamber from below.

c. Tighten the flare nuts.

d. Replace the filter-drier, leak-test, and evacuate and charge the system as instructed in paragraphs 8-11 through 8-13.

Two thermal expansion valves are used in the P-2 Air Conditioner. One meters liquid refrigerant to the evaporator coil, through a distributor which disperses the liquid refrigerant into several parts of the coil. The other injects liquid refrigerant into the circulating gas in the bypass circuit to maintain the temperature of the gas below its extreme limit. Both valves respond to temperature changes in the refrigerant suction line to which their remote bulbs are attached. The effects of pressure-drop across the evaporator coil are cancelled by a pressure equalizing line from the evaporator thermal expansion valve to the downstream (suction) end of the evaporator coil beyond the sensing bulb. This pressure equalizing line permits the valve to respond more quickly to temperature variations alone. Since pressure-drop in the liquid quench circuit is insignificant, the liquid injection-expansion valve is equalized internally. Both valves are hermetically sealed to their sensing bulbs by capillary tubes.

Access

To gain access to the two thermal expansion valves, their associated sensing bulbs, proceed as follows:
Remove 18 screws and washers from the four corners of the fabric cover, and remove the cover.
Remove 15 screws and packing washers from the top surface of the top panel, and five screws from the top flange. Remove the top panel.
Remove eight screws and lock washers from the condenser fan guard, and remove the fan guard.
Loosen two setscrews in the hub of the condenser impeller, and pull off the impeller. Use two screws in the holes in the face of the hub to start the impeller, if necessary.
Cut insulation away from sensing bulb and band clamp. Remove clamping screw from band clamp, and remove sensing bulb.

Testing

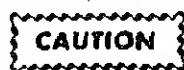
Both expansion valves are tested in the same manner. Proceed as follows:

NOTE

Because the condenser fan impeller and the top panel were removed for access, the condenser coil will be without airflow. Provide temporary airflow for the following test, by placing a high-velocity fan or blower in front of the condenser coil.

line warm up to ambient temperature.

b. Remove the sensing bulb from its band clamp, and place it against the suction line, and place it in a container of ice water or crushed ice (32°F or 0°C).



Do not let liquid refrigerant flood back into the compressor any longer than 1-2 seconds. The expansion valve will be wide open during the following procedure. Excessive flood-back of liquid refrigerant will damage the compressor.

c. Start the air conditioner by setting the thermostat at COOL, and the temperature control knob at maximum DECREASE. Remove the sensing bulb from the ice water, and hold it in one hand while feeling the suction line. If the suction line temperature drops, the valve is operating properly. Stop the air conditioner at once, and remove the sensing bulb. If the temperature of the suction line does not drop, stop the air conditioner and replace the expansion valve.

8-41. Adjusting Superheat

A refrigerant gas is said to be superheated when its temperature is higher than the evaporating temperature corresponding to its pressure at saturation. When a thermal expansion valve is set for optimum superheat (in this case 6°F or 3.3°C above the evaporating temperature of the refrigerant at its operating pressure) the evaporator coil operates at maximum efficiency. That is, the refrigerant gas does not become warm before reaching the end of the coil, which would reduce the coil's cooling capacity, and the refrigerant does not remain in the liquid state after passing completely through the coil, which could result in damage to the compressor. The superheat setting of a thermal expansion valve can be adjusted by varying the setting of a compression spring (7, figure 8-41) in the power assembly of the valve. This spring tends to hold the valve closed against the pressure in the suction line and sensing bulb and capillary tube; therefore, the greater the spring pressure, the higher the superheat. To reduce superheat, and adjust if necessary, in accordance with the following procedure:

a. Remove insulation from a spot on the suction line.

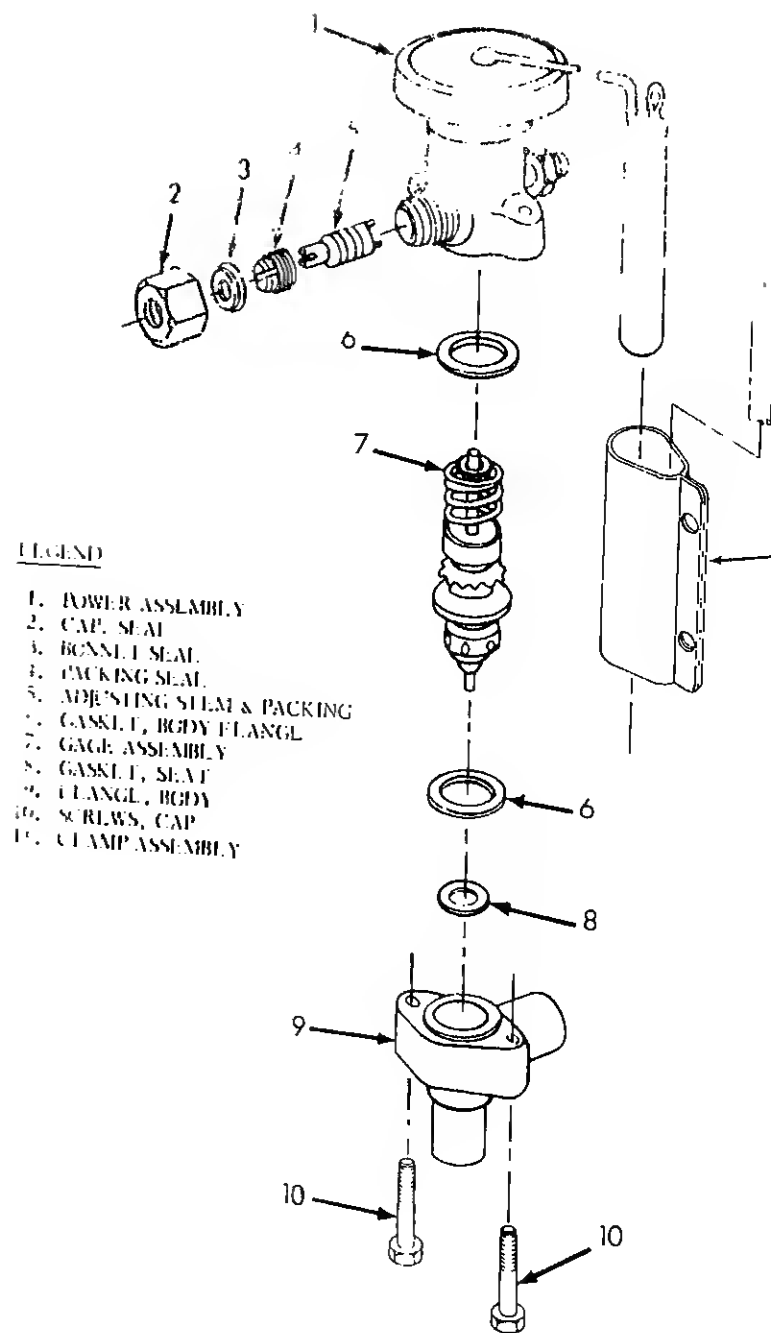


Figure 8-3. Typical Thermocouple Assembly

thermocouple on the bare spot, using a small gob of thermal mastic, if available to improve conductivity. Connect the thermometer bulb or thermocouple junction

in position, and cover with insulating material.

c. Connect a suitable pressure gauge to the service valve, and open the valve.

Table 8-1 Pressure - Temperature Relationship of Saturated Refrigerant-22

Temperature		Pressure		Temperature		Pressure	
F	Deg C	Psig	kg/cm ²	Deg F	Deg C	Psig	kg/cm ²
	-12.3	32.93	2.315	66	18.9	114.2	8.029
	-11.1	34.68	2.439	68	20.0	118.3	8.318
	-10.0	36.89	2.593				
	- 8.9	38.96	2.739	70	21.1	122.5	8.612
	- 7.8	41.09	2.889	72	22.2	126.8	8.915
				74	23.3	131.2	9.225
	- 6.6	43.28	3.043	76	24.4	135.7	9.541
	- 5.5	45.23	3.180	78	25.6	140.3	9.864
	- 4.3	47.85	3.364				
	- 3.4	50.24	3.532	80	26.7	145.0	10.195
	- 2.2	52.70	3.705	82	27.8	149.8	10.522
				84	28.9	154.7	10.877
	- 1.1	55.23	3.883	86	30.0	159.8	11.236
	0	57.83	4.066	88	31.1	164.9	11.594
	1.1	60.51	4.254				
	2.2	63.27	4.448	90	32.2	170.1	11.960
	3.3	66.11	4.648	92	33.3	175.4	12.332
				94	34.5	180.9	12.719
	4.4	69.02	4.853	96	35.6	186.5	13.113
	5.5	71.99	5.062	98	36.7	192.1	13.506
	6.6	75.04	5.276				
	7.7	78.18	5.497	100	37.8	197.9	13.914
	8.8	81.40	5.723	102	38.9	203.8	14.329
				104	40.0	209.9	14.758
	10.0	84.70	5.955	106	41.1	216.0	15.187
	11.1	88.10	6.257	108	42.2	222.3	15.630
	12.2	91.5	6.433				
	13.3	95.1	6.686	110	43.3	228.7	16.080
	14.5	98.8	6.947	112	44.4	235.2	16.537
				114	45.6	241.9	17.008
	15.6	102.5	7.206	116	46.7	248.7	17.486
	16.7	106.3	7.474	118	47.8	255.6	17.971
	17.8	110.2	7.748				

Operate the air conditioner in the cooling mode about 30 minutes, observing the thermometer or thermocouple dial to see that the temperature has

(1) Evaporator expansion valve: $6^{\circ} \pm 1.3^{\circ} \pm 0.8^{\circ}\text{C}$

(2) Quench expansion valve: $30.4^{\circ} \pm 0.8^{\circ}\text{C}$

to raise, and counterclockwise to lower, the pressure setting. Do not turn more than two full turns, then wait two minutes for temperature to stabilize before observing temperature and pressure readings.

(3) When the proper setting is obtained, replace screw cap and seal on the valve adjusting stem (5). Remove the thermometer or thermocouple probe from the suction line, and replace the insulating material. Close the suction service valve, remove the pressure gauge, and install the cap on the service valve gauge port.

Removal

Whenever a leak is detected or a refrigeration component must be replaced, you must discharge gas from the refrigeration system. To do this, attach a suitable length of hose to the gauge port of the suction service valve. (Refer to figure 8-2 for identification of service valves). Lead the discharge end of the hose to an outdoor location at which gas can be safely discharged. Crack the suction service valve open to discharge the gas slowly, for a period of 5-6 hours. Rapid discharge will cause compressor oil to be blown out of the system. Remove the expansion valve from the air conditioner as directed in the following steps: (See figure

8-43. a. Remove insulation and band clamp from sensing bulb.

b. Carefully detach bulb and capillary tube.

c. Remove two capscrews (10) securing the power assembly (1) to the valve body (9). Remove the power assembly, capillary tube and sensing bulb.

d. Remove two capscrews that secure the valve body to the support bracket. Detach equalizer line, if applicable.

CAUTION

Maintain a 1-2 cfm (0.1 - 0.2M³/min) flow of dry nitrogen through the refrigeration system to prevent oxidation and scaling when brazing or debrazing components.

8-43. Installation

Install the expansion valve in accordance with the following procedure:

a. Disassemble the valve by removing the capscrews (10) that secure the power assembly to the valve body (9), and separate the two.

b. Install the valve body in the support bracket and secure with two capscrews, finger tight. Connect the tubing.

c. With dry nitrogen flowing through the refrigeration system braze tubing joints. Let cool. Tighten capscrews.

d. Install power assembly (1, figure 8-3) on the valve body, being careful to fit lugs on the cage assembly into the cavities in the body (9). Secure with two capscrews (10). Connect equalizer line, if applicable.

e. Wrap the capillary tube with a double thickness of insulating tape, being careful to avoid kinking the tube.

f. Carefully lead the sensing tube to its position on the suction line. Clamp in position to the suction line. Cover suction line, sensing bulb and clamp with insulating material.

g. Carefully form the capillary tube along and under the piping, and tape to support.

h. Leak-test in accordance with paragraph 8-44.

8-44. Final Assembly

When the air conditioner has been successfully leak-tested, replace the filter-drier as directed in paragraphs 8-11 and 8-13. This procedure includes evacuation, charging and pressure-testing the assembly. Complete the assembly as follows:

a. Position the top panel on the air conditioner and secure with 15 screws and packing washers in the front surface and five screws through the rear flange.

b. Fit the fabric cover over the back of the air conditioner, and secure with 18 screws and washers.

a common set of fins: the condenser coil itself, the subcooler coil. (See Refrigeration Diagram, 8-2-2). The condenser coil assembly is located at the bottom rear section of the air conditioner, and is protected by a grille and screen assembly to protect it from damage and dirt.

Before removing the condenser coil, the refrigerant system must be completely discharged. (Refer to figure 8-2 for identification of service valves). Connect a hose of sufficient length to duct gas to a safe place, preferably outside, to the suction service valve. Crack the valve open slowly to discharge refrigerant over a period of 15 to 20 hours. Too rapid discharge will cause oil to be blown out of the system. After the refrigerant has been completely discharged proceed with the removal of the condenser coil as directed in the following procedure:

lower panel.
Obtain access to the filter-drier, and remove it as directed in paragraphs 8-11 and 8-12.

Remove the screw which secures the receiver clamp to the bracket.

Remove 18 screws and washers from the four sides of the fabric cover, and remove the fabric cover. Remove four screws and washers from the upper edge of the condenser coil guard, and four screws, washers and lock washers from the lower edge. Remove the condenser coil guard.

Remove four screws in a vertical line on each side of the casing. These screws secure the condenser coil to the casing.

Provide a 1-2 cfm (0.1 - 0.2 M³/min) flow of dry nitrogen through the system at the discharge service valve. After three minutes of nitrogen purging, size the tubing coming from the compressor and to the liquid line going to the sight-glass liquid indicator. It is not necessary to debraze the receiver at this time. Draw the condenser coil from the air conditioner.

Servicing

Service the condenser coil after removal from the air conditioner as directed below:

Cleaning. Cap or plug all openings, and tape caps or plugs to prevent accidental removal. No water is to be permitted to enter the coil. When thoroughly

Section XI. EVAPORATOR COIL

Description

The evaporator coil receives liquid refrigerant from the expansion valve, and evaporates the liquid to a gas by absorbing heat from the airflow passing over the outside surface of the coil. The evaporator coil is located in the top front section of the air conditioner.

Access

Obtain access to the evaporator coil as directed in the following procedure:

Remove 18 screws and washers from the four sides of the fabric cover, and remove the cover.

Remove 15 screws and packing washers from the surface of the top panel, and five screws from the top flange. Remove the top panel.
Detach the evaporator discharge grille by turning

for five minutes to soak loose caked-on dirt, then rotate the coil vigorously in the solution to remove dirt from between the fins. Rinse thoroughly in clean water.

b. Fin Alignment. If fins are bent or crushed, straighten them with a wood or plastic blade so that they are straight and parallel. Badly bent or crushed fins can cause serious distortion of airflow, resulting in inefficient operation of the air conditioner.

8-48. Installation

Install the condenser coil in the air conditioner as directed in the following steps:

NOTE

If the receiver was removed, or a new coil is being installed, install the receiver to the coil assembly and braze joints before installing the coil in the air conditioner.

a. Position the condenser coil in the air conditioner with all tubing joints meeting properly. Secure the coil with four screws through each side of the casing.

b. Start a flow of 1-2 cfm (0.1 - 0.2 M³/min) of dry nitrogen through the system at the discharge service valve. After three minutes of nitrogen purging, braze the joints.

c. Install a new filter-drier, and complete the assembly and charging of the air conditioner in accordance with paragraph 8-1-3.

e. Tag and disconnect wires to heating elements. Remove hold-down clamps from six heating elements by unscrewing the panel fastener screw in each corner. Remove heating elements by pulling straight up.

f. Remove the evaporator/condenser fans and the motor. (Refer to Chapter 10).

8-51. Removal

Remove the evaporator coil from the air conditioner in accordance with the following instructions:

a. Refer to figure 8-2 for identification of service valves; then connect a hose of sufficient length to carry refrigerant gas to a safe area, preferably outdoors, to the suction service valve. Crack the valve open to discharge the gas slowly, over a period of 5-6 hours. Too rapid discharge will cause oil

(3) Provide a flow of 1-2 cfm (0.1 - 0.2 M³/min) of dry nitrogen through the system from the discharge service valve for at least three minutes, then debraze the liquid line from the expansion valve.

c. Remove evaporator/condenser fan motor to gain access to suction line flange connection. (Refer to Chapter 10).

d. Remove three capscrews from the rear of the suction line flange connection, and separate the two halves of the flange connection slightly. Remove and discard the O-ring.

e. Remove four screws and packing washers from the casing and evaporator coil bracket on each side of the air conditioner. Lift the coil straight up, and remove it from the air conditioner.

52. Servicing

Service the evaporator coil after removal from the air conditioner, as directed below:

a. *Cleaning.* Cap or plug all openings, and tape caps or plugs to prevent accidental removal. No water must be permitted to enter the coil. When thoroughly sealed, immerse the coil in warm detergent solution for five minutes to soak loose caked-on dirt, then agitate the coil vigorously in the solution to remove dirt from between the fins. Rinse thoroughly in clear water.

b. *Fin Alignment.* If fins are bent or crushed, straighten them with a wood or plastic blade so that they are straight and parallel. Badly bent or crushed fins can cause serious distortion of airflow, resulting in inefficient operation of the air conditioner.

53. Disassembly

If a new coil is to be installed, debraze the distributor assembly from the old coil at three places. Remove mist eliminator retaining channels from the coil by removing four screws from each channel.

54. Assembly

Assemble the evaporator coil in the following manner.

the partition.

NOTE

If a new liquid line expansion valve body is to be installed, braze the distributor body into the discharge port of the expansion valve before assembling the valve.

c. Position the liquid line expansion valve body (figure 8-3) on its support bracket, and align by securing with two screws (10) and slave nuts. Do not install power assembly at this time. Braze liquid line to valve body.

d. Install new gaskets (6) and seat (8) in valve body.

e. Place cage assembly (7) in power assembly. Remove screws (10) and fit bosses of cage assembly into recesses in valve body. Secure power assembly to valve body (9) with screws (10). Connect equalizer line flare nut.

f. Install the evaporator/condenser fans and motor. (Refer to Chapter 10.)

g. Purge the refrigeration system with dry nitrogen at 1-2 cfm (0.1 - 0.2 M³/min) for 15 minutes.

h. Install heating elements in accordance with paragraph 9-5.

i. Install the mist eliminator by sliding it straight down in the channels in front of the evaporator. Make sure that TOP mark is up, and that airflow arrows point outward.

j. Install a new filter-drier, leak-test, and charge the refrigeration system as instructed in paragraphs 8-11 through 8-13.

k. Position the top panel on the air conditioner. Secure it with 15 screws and packing washers through the top surface, and five screws through the flange.

l. Place the evaporator air discharge grille in the opening, and secure it by turning the six cam studs clockwise.

m. Fit the fabric cover over the back of the air conditioner, and secure it with 18 screws and washers on all four sides.

Section I. HEATING ELEMENTS

8. Description (See figure 9-1.)

The six steel sheathed resistance heating elements are located immediately behind the evaporator coil, and extend all the way across the width of the air conditioner. Three of the elements are energized when the selector switch is set at LO HEAT, and all six elements are energized when the selector switch is set at HEAT. The temperature control thermostat controls only the elements energized by the LO HEAT setting. All six elements are protected against overheating by a thermal overload protector (heater thermostat).

Access

Obtain access to the heating elements as directed in the following steps:

WARNING

Disconnect power from the air conditioner before performing maintenance on the electrical system. The voltage used can be lethal.

- a. Remove 18 screws and washers from the four sides of the fabric cover, and remove the cover.
- b. Remove 15 screws and packing washers from the top surface of the top panel, and five screws from the rear flange. Remove the top panel.

c. Removal

Remove the heating elements from the air conditioner in the following manner: (See figure 9-1.)

- a. Tag and disconnect wire leads from the ends of each element by unscrewing terminal nuts.

NOTE

Continuity testing of each element can be performed at this time if further disassembly is not required. (Refer to paragraph 9-4)

- b. Unscrew the panel fastener screw in each hold-down clamp and remove the clamp. Pull each element straight up to remove.

9-4. Inspection/Test

Visually inspect each heating element for damage, deformation, damaged terminal threads, cracked or broken sheath, or burnt-out spots. If damaged, replace. Using an ohmmeter, multimeter or continuity tester, check continuity of each heating element. Replace elements that do not indicate continuity.

9-5. Installation

Install the heating elements in accordance with the following procedure:

- a. Insert each heating element down between the heater mounting bar and the evaporator coil, each mounting arm equidistant from the panel fastener screw hole. Place hold-down clamp over the mounting arms, and secure with the panel fastener screw.

- b. Make proper wiring connections. (See wiring diagram, figure FO-1)

- c. Position the top panel on the air conditioner. Secure it with 15 screws and packing washers on the top surface, and five screws through the rear flange.

- d. Fit the fabric cover over the back of the air conditioner, and secure all four sides with 18 screws and washers.

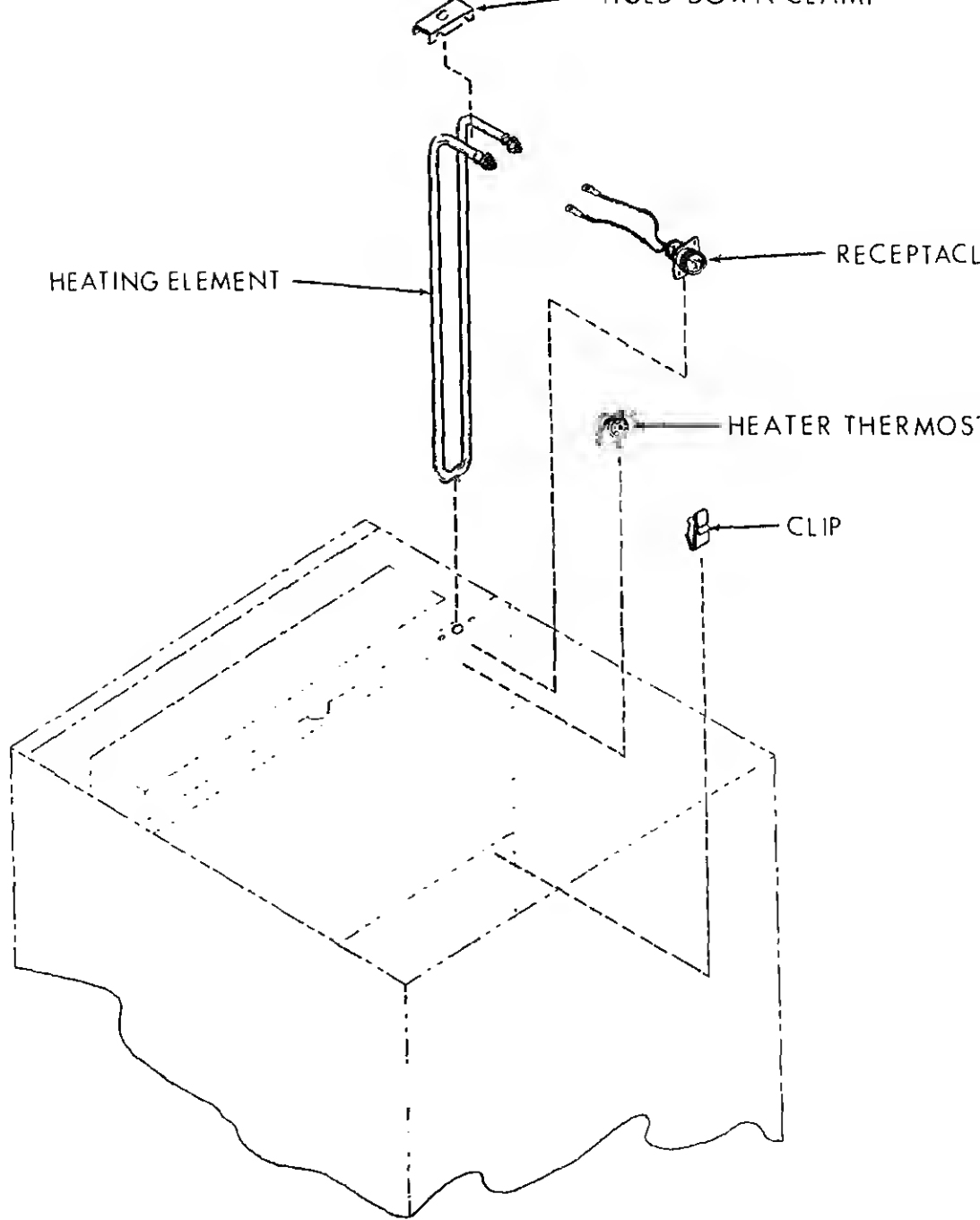
Section II. HEATER THERMOSTAT

8. Description

The heater thermostat is a thermal overload protector, located behind and between the heating elements. It is electrically connected to the heating elements in such a way that if temperature exceeds a preset maximum, the heater thermostat opens the circuit. When the thermostat automatically resets, thereby closing the circuit to the heating elements.

9-7. Access

Obtain access to the heater thermostat as directed below:



Removal

Remove the heater thermostat from the air conditioner as follows:

WARNING

Disconnect power from the air conditioner before performing maintenance on the electrical system. The voltage used can be lethal.

NOTE

If desired, two heating elements may be removed for greater convenience in manipulating the thermostat's attaching hardware.

Tag and disconnect wire leads from the heating elements to the heater thermostat.

Remove two screws and self-locking nuts from heater thermostat. Remove the thermostat.

Inspection/Test

Visually inspect the heater thermostat for cracks in housing, missing pieces or other damage. Replace if damaged. Test as follows:

Using an ohmmeter or other continuity tester, check continuity of the wire leads attached to terminals 4-5, 5-6 and 4-6 of the heater thermostat. Continuity should be indicated.

of the wire leads. Gradually apply heat, and observe both the thermometer and the continuity tester. Continuity should drop out at $194^{\circ} \pm 9^{\circ}\text{F}$ ($90^{\circ} \pm 5^{\circ}\text{C}$). While still continuing to watch the thermometer, the continuity test, let the heater thermostat cool. Continuity should be re-established at $142^{\circ} \pm 9^{\circ}\text{F}$ ($61^{\circ} \pm 5^{\circ}\text{C}$).

c. Repeat step b with the continuity tester connected to each of the other two pairs of terminals.

d. If the heater thermostat does not meet temperature and continuity requirements, replace it.

9-10. Installation

Place the body of the heater thermostat in the mounting hole of the heater assembly support, secure with two screws and self-locking nuts. Continue the installation as follows:

NOTE

If two heating elements were removed for convenience, replace them at this time.

a. Connect wire leads as required. (See wiring diagram, figure FO-1)

b. Place the top panel on the air conditioner, secure with 15 screws and packing washers in the front surface, and five screws through the rear flange.

c. Fit the fabric cover over the back of the air conditioner, and secure all four sides with 18 screws and washers.

MAINTENANCE OF FANS AND MOTORS

Section I. EVAPORATOR FAN

1. Description

The evaporator fan is located behind the evaporator intake grille and the air filter. The fan is driven by a double-shafted two-speed motor, and consists of a centrifugal impeller and an inlet ring. Airflow from the evaporator fan is directed upward into the space around the heating elements and evaporator coil, and is discharged through those components before passing out through the evaporator discharge grille.

2. Removal

Remove the evaporator fan from the air conditioner in accordance with the following instructions. (See Figure 10-1.)

Remove the evaporator air intake grille by turning six cam-lock studs counter-clockwise to unlock, and remove the grille.

Remove the air filter by unscrewing two screws from the retaining strip on the right-hand side of the filter. Pull the right-hand side of the filter outward to the right to release it from the left-hand retaining channel.

Remove eight screws from the circumference of the inlet ring, and remove the inlet ring.

Loosen the two setscrews at right angles to each other in the hub of the impeller. Pull the impeller off the motor shaft if possible. If the impeller cannot be pulled from the shaft, thread two 5/16-18 screws into the threaded holes in the face of the hub to act as setscrews. Tighten both in equal increments until the impeller is free.

3. Inspection

Inspect the inlet ring for nicks, dents, gouges, deformation

or evidence of rubbing. Replace the inlet ring if damaged. Inspect the impeller for gouges, deformation, evidence of rubbing, or broken welds. Replace the impeller if damaged, or if repair would unbalance its rotation.

10-4. Installation

Install the evaporator fan as directed in the following steps:

CAUTION

Do not hammer the impeller onto the motor shaft. The motor bearings would be damaged. In case of difficulty, dress out rough spots on the shaft with a fine file, stone or abrasive cloth. Apply a coating of light oil to case assembly.

a. Place key in the shaft keyway, and install the impeller on the shaft. The end of the shaft should be even with the face of the hub. Tighten the setscrews over the key first, finger tight, then tighten the remaining setscrew. Tighten both setscrews to a final torque of 78-82 pound-inches (898-945 gram-meters).

b. Position the inlet ring, flat edge up, into the circular fan opening. Secure with eight screws. Rotate the impeller by hand to be sure that no rubbing exists between the impeller and the inlet ring if necessary.

c. Install air filter in left-hand retaining channel and install retaining strip with two screws.

d. Position evaporator air intake grille on the air conditioner, and secure by turning six cam-lock studs counter-clockwise.

Section II. CONDENSER FAN

5. Description

The condenser fan is located behind the circular fan guard on the back of the air conditioner. The fan is driven by one end of a double-shafted two-speed motor. It consists of an aluminum axial impeller

10-6. Removal

Remove the condenser fan from the air conditioner in accordance with the following procedure:

a. Remove eight screws and lock washers from the rim of the condenser fan guard, and remove the

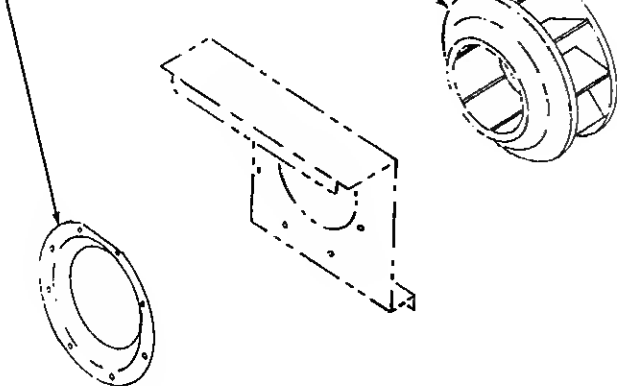
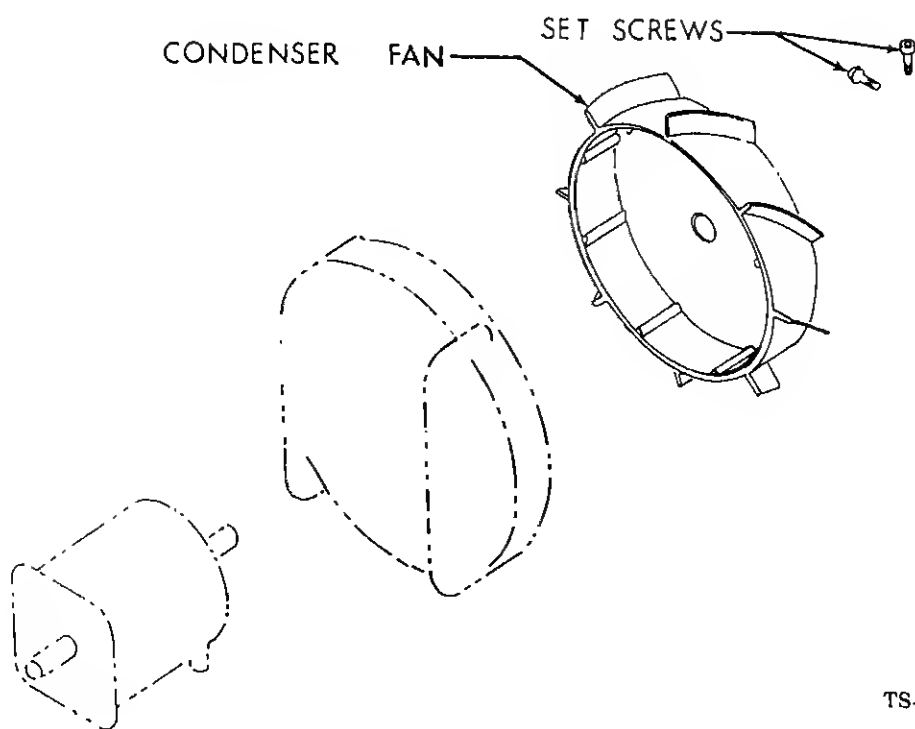


Figure 10-1. Evaporator Fan Details.



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Figure 10-2. Condenser Fan Details.

7. Inspection

Visually inspect the condenser fan impeller for cracks, gouges, cracked welds, missing pieces and deformation. Check outer ends of blades for evidence of bending or scraping. If there is damage sufficient to unbalance the impeller, replace it.

8. Installation

Install the condenser fan as directed in the following procedure:

CAUTION

Do not hammer the impeller onto the motor shaft. The motor bearings would be damaged. If difficulty is encountered, dress out rough spots on the

and press impeller onto shaft. The end of the motor shaft should be even with the face of the hub when the impeller is completely in position. Tighten setscrews finger tight. Starting with the keyway setscrews, tighten to a final torque of 78-82 pound-inches (898-945 gram meters).

NOTE

In order to direct the condenser exhaust upward, away from the intake, the condenser fan guard is designed so that it can be installed in only one way. All screw holes must match to permit proper installation.

b. Position the condenser fan guard properly on the air conditioner, and secure it with eight screws and lock washers.

Section III. FAN MOTOR

1. Description

The fan motor is double shafted to drive the evaporator fan impeller at one end, and the condenser fan impeller at the other. The motor contains two sets of windings, which permits two-speed operation. The motor, using one set of windings, is 1725 rpm. When the second set of windings is switched on, the speed is changed to 3450 rpm. The motor contains permanently lubricated anti-friction bearings, and is protected against overheating by a thermal overload protector.

2. Removal (See figure 10-3.)

Remove the fan motor in accordance with the following procedure:

WARNING

Disconnect power from the air conditioner before performing maintenance work on the electrical system. The voltage used can be lethal.

a. Remove the evaporator intake grille by turning the six cam-lock studs 1/4-turn counter-clockwise to unlock, then lift off the grille.

b. Remove the air filter retaining strip by removing the screws. Remove strip and air filter.

d. Loosen two setscrews in the hub of the evaporator fan impeller, and pull the impeller off the motor shaft. If the impeller cannot be pulled off manually, thread two 5/16-18 screws into the threaded holes in the face of the hub to use as jackscrews or to attach a wheel puller.

e. Remove eight screws and lock washers from the rim of the condenser fan guard, and remove the guard.

f. Loosen the two setscrews in the hub of the condenser fan impeller, and pull the impeller off the motor shaft. If difficulty is encountered, the 1/4-20 threaded holes in the face of the hub can be used to attach a wheel puller.

g. Unscrew but do not remove four screws attaching the baffle (figure 10-3) to the mounting assembly. Remove the baffle, with screws and spacers attached, as a unit.

h. Disconnect wiring harness plug, P9, from the receptacle, J9, on the motor junction box.

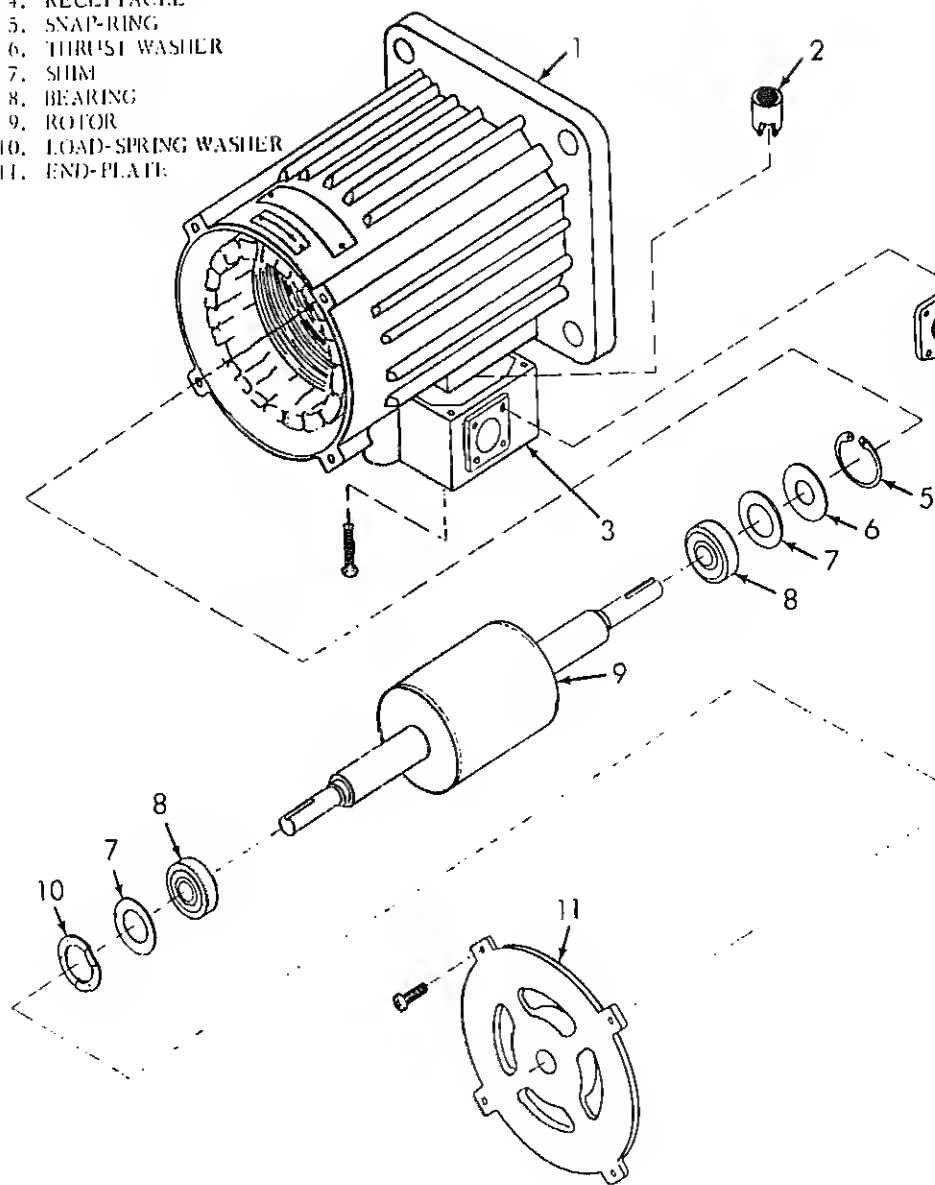
i. Carefully remove two socket head capscrews, lock washers, flat washers and bushings which secure the motor mounting feet to the mounting crossbar.

j. Remove four self-locking nuts, flat washers, lock washers and flat-head screws from the corners of the motor mounting flange.

k. Carefully withdraw the motor through the

LEGEND

1. STATOR (FRAME)
2. THERMAL CUTOFF
3. JUNCTION BOX
4. RECEPTACLE
5. SNAP-RING
6. THRUST WASHER
7. SHIM
8. BEARING
9. ROTOR
10. LOAD-SPRING WASHER
11. END-PLATE



ing rough operation. If present, turn the shaft slowly backward and forward by hand to feel roughness. Replace bearings if roughness is evident.

grip the rotor shaft, and attempt to pull it in and to check for end-play. If there is, replace load spring or shim(s).

Using an ohmmeter or other continuity testing device, check continuity between connector pins E-D, F and D-F, and between G-H, H-J and G-I. Continuity should be indicated. Also check to be sure that continuity exists between each pin and the motor frame (stator). If continuity requirements are not met, replace the motor.

12. Disassembly

Disassemble the motor only to the extent necessary to effect repairs. Proceed as follows:

Remove four screws from the 3-3/4-inch bolt diameter of the end plate (11, figure 10-3), and remove end plate.

CAUTION

Keep load spring, shims and washers in their proper relationships at disassembly if they will be needed at assembly.

Withdraw the rotor (9) from the stator (1), and set aside until needed for assembly.

Using an arbor press or equivalent, press the bearings (8) out of the end plate and the stator, being careful to avoid cocking.

Remove four screws from the corners of the junction box (3, figure 10-3) and lift box away from stator. Tag wires for identification, and unsolder from connector.

Remove four screws from corners of connector, and remove connector from junction box (3).

13. Cleaning

WARNING

Dry cleaning solvent (Fed. Spec. P-D-680) used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).

Do not attempt to clean or re lubricate them. Keep bearings in plastic bags or wrap securely in grease-proof paper until needed for assembly.

Blow loose dirt from cavities and windings. Clean external surfaces with a cloth moistened with cleaning solvent (Fed Spec. P-D-680).

10-14. Assembly

Assemble the motor as directed in the following procedure. (See figure 10-3.)

a. Pull wires through connector hole in junction box (3), and solder them to their respective connector terminals. (See wiring diagram, figure FO-1, for proper connections.)

b. Install receptacle (4, figure 10-3) in junction box (3), and secure with four screws.

c. Position junction box (3) on motor frame (stator), and secure with four screws through corners.

d. Install a bearing (8), shim (7) and washer (6), in that order, on the shorter shaft of the rotor (9). Insert the rotor into the stator (1), and guide the bearing into the bearing recess in the stator.

e. Place a bearing (8), shim (7) and load spring (5), in that order, over the longer shaft of the rotor. Carefully fit end plate (11) over the assembly, guiding the bearing into the bearing recess.

f. Secure the end plate (11) to the stator (1) with four screws, tightened uniformly in increments. Attempt to turn shaft by hand. If shaft does not turn freely, check assembly of end plate on stator, and correct just if necessary.

10-15. Installation

Install the motor in the air conditioner as directed in the following procedure: (See figure 1-7).

a. Position the flange end of the motor against the partition. Install four flat-head screws through the partition and the holes in the corners for the mounting flange. Place a bushing, a washer and a locking nut on each screw, and tighten finger-tight.

NOTE

Trial-fit resilient washers of the same thickness at first, then replace with different sizes if necessary to center impellers.

der bolt, and partially insert bolt into hole in cross-bar. On top of cross-bar, place a resilient washer, large flat washer and small flat washer between the cross-bar and the motor mounting foot. Push bolt and bushing up through the resilient washer, and screw bolt into the motor mounting foot. Repeat assembly in the same order for the other mounting foot. Tighten both bolts uniformly, and check for concentricity of impellers and openings. Adjust by replacing resilient washers with those of a different thickness, as required. When satisfactory, tighten all mounting bolts, including the four bolts and nuts in the corners of the flange.

Connect wiring harness plug, P9, to the receptacle on the motor's junction box. Temporarily connect power to the air conditioner, and turn mode selector switch to VENTILATE. Check operation and direction of rotation of motor at LO SPEED, and HI SPEED settings.

Place a lock washer and flat washer on each convex side of baffle. Place a spacer over each screw on convex surface, and tape in place with masking tape. Carefully position the convex side of the baffle against the mounting bracket, and secure by tightening the four screws.

CAUTION

**Do not hammer impeller onto shaft.
Motor bearings would be damaged.**

a coating of light oil to ease assembly.

e. Place key in shaft keyway and press condenser fan impeller onto shaft. End of shaft should be flush with face of hub. Tighten both setscrews finger-tight. Starting with the keyway setscrew, tighten both setscrews to a final torque of 78-82 pound-inches (898-945 gram-ineters).

NOTE

The fan guard is designed so that it can be installed only one way. All screw holes must match to permit proper installation.

f. Place the condenser fan guard on the air conditioner, and secure it with eight screws and washers.

g. Install key in shaft keyway, and press evaporator fan impeller onto shaft. End of shaft should be flush with the hub face when installed. Tighten both setscrews finger-tight, then tighten to final torque of 78-82 pound-inches (898-945 gram-ineters) (starting with the keyway setscrew).

h. Place the air filter in position, and install the air filter strip with two screws.

i. Position evaporator air intake grille on air conditioner, and secure by turning the six cam-locks 1/4 turn clockwise.

Repair Methods

Preferred repair methods consist of replacing wires, terminals, connectors, etc. rather than splicing wires, joining ends to form terminals, and other make-shift procedures, although the latter may be appropriate for emergency field repairs. Determine the proper size and length of wire, terminal or connector to be used by replacement by referring to Table 11-1, Wire List, and to the wiring diagram (figure F0-1).

Soldering Connections. Wire connections must be made mechanically sound before they are soldered; solder alone does not provide sufficient strength to prevent breakage. Joining surfaces of connections to be soldered must be clean and bright. If a separate flux is used, it should conform to Specification MIL-95, Type I, rosin-alcohol flux, and should be heated onto the joint before soldering. If a flux-core solder is used, it should always be rosin-core electrical grade. If an uncured solder is used, it should be a tin solder conforming to Specification QQ-S-571. Solder should always be heated to the point at which solder will melt completely and flow into all parts of the joint. Excessive build-up of solder "gobs" on the joint should be avoided or removed.

Insulating Joints. The preferred method of in-

sulating electrical joints is by the use of heat-shrink tubing. To apply, cut a piece of heat-shrink tubing of suitable diameter to a one-inch length for joints at terminals or connectors, or to a length 1/2-inch longer than the joint to be insulated. Slide the tubing over the wire before making the joint. After the joint is made, slide the tubing over the joint and shrink in place with moderate heat.

c. Splicing Wires. To repair broken or cut wires that are otherwise sound, the mating ends can be soldered and spliced. A commercial butt splice can be soldered onto the ends to joint them, or a "Western" splice wire splice can be made. The latter is made by stripping one 1-1/4 inch of insulation from the wires, holding the ends parallel and facing opposite directions, then twisting each end around the other for at least three turns. Solder and apply insulation as described above.

d. Crimping Terminals. To install a terminal on the end of a wire, strip 1/4 - 1/2 inch of insulation from the end of the wire, apply a one-inch piece of heat-shrink tubing (if the terminals are of the uninsulated type) and insert wire-end into the shank of the terminal. Crimp the shank, and install heat-shrink tubing if necessary.

Table 11-1

WIRE LIST

Wire No.	FROM		TO		Length (Inches)
	Terminal Type	Term. No.	Terminal Type	Term. No.	
Wiring Harness — Control Module					
A16N	MS3102R28-11P	J7-A	MS25036-108	E2	3
14B	MS3102R28-11P	J7-M	Both in	S1-41	8
16B	13211E8288	S1-31	13211E8288	S1-41	2.62
16	13211E8288	J7-X	Both in	S1-11	10
16	13211E8288	S1-11	MS25036-153	S2-1	8.5
16	MS3102R28-11P	J7-W	13211E8288	S1-10	10
14C	MS3102R28-11P	J7-K	13211E8288	S1-4	9
A16	MS3102R28-11P	J7-N	13211E8288	S1-1A	11
14A	MS3102R28-11P	J7-J	Both in	S1-22	10.37
16A	13211E8288	S1-32	13211E8288	S1-22	1.75
A16	MS3102R28-11P	J7-T	13211E8288	S1-1B	11

Wiring Harness — Control Module (Con't)

X6A16A	MS3102R28-11P	J7-I	13211E8288	S1-2B	10.37
X11A16B	MS3102R28-11P	J7-C	13211E8288	S1-2C	9.37
X9A16A	MS3102R28-11P	J7-V	13211E8288	S1-3A	9.62
X10A16B	MS3102R28-11P	J7-U	13211E8288	S1-3C	8.62
X8A16C	MS3102R28-11P	J7-E	13211E8288	S1-4A	9
X7A16B	MS3102R28-11P	J7-D	13211E8288	S1-4C	8
X4F16	MS3102R28-11P	J7-B	MS25036-106	S8-2	4
X13C16B	MS3102R28-11P	J7-H	13211E8288	S1-21	9.47
V6A16	13211E8288	S1-12	MS25036-153	S2-2	4.5
V3G16	MS25036-153	S2-1	MS25036-106	S8-1	5

Electrical Lead Pressure Cutout Switches

V7A16	MS25036-153	S6-1	MS25036-153	S7-2	3.00
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Wiring Harness — Power Input to RF1 Filter

X2A10A	MS3100R22-22P	J1-A	MS3106R22-22S	P10-A	35.5
X3A10B	MS3100R22-22P	J1-B	MS3106R22-22S	P10-B	35.5
X4A10C	MS3100R22-22P	J1-C	MS3106R22-22S	P10-C	35.5
X5A10N	MS3100R22-22P	J1-D	MS3106R22-22S	P10-D	35.5

Wiring Harness — Junction Box Power Input

X2B10A	MS3102R22-22P	J2-A	MS25036-112	TB1-1	6.25
X3B10B	MS3102R22-22P	J2-B	MS25036-112	TB1-2	6.75
X4B10C	MS3102R22-22P	J2-C	MS25036-112	TB1-3	7.25
X5B10N	MS3102R22-22P	J2-D	MS25036-112	E1	4.50

Wiring Harness — Power Input from RF1 Filter

X2L10A	MS3106R22-22P	P11-A	MS3106R22-22S	P2-A	30.5
X3L10B	MS3106R22-22P	P11-B	MS3106R22-22S	P2-B	30.5
X4L10C	MS3106R22-22P	P11-C	MS3106R22-22S	P2-C	30.5
X5C10N	MS3106R22-22P	P11-D	MS3106R22-22S	P2-D	30.5

Wiring Harness — Heater

X15C16A	MS3100R14S-6P	J8-A	MS25036-108	HR1-A	13.75
X19C16B	MS3100R14S-6P	J8-B	MS25036-108	HR2-A	11.25
X17C16C	MS3100R14S-6P	J8-C	MS25036-108	HR3-A	8.75
X8C16C	MS3100R14S-6P	J8-D	MS25036-108	HR4-A	6.25
X7C16B	MS3100R14S-6P	J8-E	MS25036-108	HR5-A	3.75
X9C16A	MS3100R14S-6P	J8-F	MS25036-108	HR6-A	5.75
X24B16A	MS25036-108	HR1-B	MS25036-108	HR6-B	16.5
X21B16B	MS25036-108	HR2-B	MS25036-108	HR5-B	9.0

WIRE LIST

No.	FROM		TO		Length (Inches)	Wire Size
	Terminal Type	Term. No.	Terminal Type	Term. No.		
Wiring Harness — Junction Box						
6A	MS3102R36-7S	J3-P	MS25036-153	K5-A2	7.87	16
6B	MS3102R36-7S	J3-P	MS25036-153	K5-B2	7.25	16
6A	MS3102R36-7S	J3-S	MS25036-153	K5-C2	6.63	16
6B	MS3102R36-7S	J3-h	MS25036-153	K5-D2	6.00	16
6A	MS3102R36-7S	J3-U	MS25036-153	K5-C1	6.63	16
6B	MS3102R36-7S	J3-R	MS25036-153	K5-D1	6.00	16
	MS3102R36-7S	J3-Z	MS25036-153	K5-X2	6.25	16
6A	MS25036-153	K5-A1	MS25036-153	K4-A1	6.00	16
	MS25036-153	K5-X2	MS25036-153	K4-X2	8.12	16
6B	MS25036-153	K5-B1	MS25036-153	K4-B1	6.63	16
6B	MS25036-153	K5-D3	MS25036-153	K4-B3	7.62	16
6A	MS25036-153	K5-C3	MS25036-153	K4-A3	8.50	16
A	MS3102R36-7S	J3-c	MS25036-153	K4-A2	10.63	16
6B	MS3102R36-7S	J3-a	MS25036-153	K4-B2	10.00	16
6C	MS3102R36-7S	J3-X	MS25036-153	K4-C2	9.37	16
6C	MS3102R36-7S	J3-W	MS25036-153	K4-D2	8.75	16
6C	MS3102R36-7S	J3-V	MS25036-153	K4-D1	8.75	16
	MS3102R36-7S	J3-O	MS25036-153	K4-X2	9.00	16
N	MS25036-153	K4-X1	MS25036-153	K5-X1	9.00	16
	MS3102R36-7S	J3-f	MS25036-153	XF2-2	14.75	16
	MS3102R36-7S	J3-g	MS25036-153	XF2-2	14.75	16
	MS3102R36-7S	J3-C	MS25036-106	TB2-1	7.25	16
6	MS3102R36-7S	J3-E	MS25036-106	TB2-2	7.62	16
6	MS3102R36-7S	J3-G	MS25036-106	TB2-3	8.00	16
6	MS3102R36-7S	J3-H	MS25036-106	TB2-4	8.38	16
	MS3102R36-7S	J3-I	MS25036-106	TB2-5	8.75	16
	MS3106R36-7S	J3-J	MS25036-106	TB2-5	8.75	16
N	MS3106R36-7S	J3-K	MS25036-106	TB2-6	9.12	16
N	MS25036-153	K5-X1	MS25036-106	TB2-6	9.12	16
2B	MS3102R36-7S	CB1-B1	MS25036-112	K1-B2	12.95	12
2A	MS3102R36-7S	J3-v	13216E6191-3	CB1-A2	20.62	12
2C	MS3102R36-7S	J3-w	13216E6191-3	CB1-C2	20.62	12
	MS3102R36-7S	J3-D	MS25036-106	TB2-1	7.50	16
6N	MS3102R36-7S	J3-F	MS25036-153	K1-X1	17.37	16
6A	MS3102R36-7S	J3-L	MS25036-108	K2-A1	16.63	16

Wiring Harness — Junction Box (Con't)

V11C16	MS3102R36-7S	J3-d	MS25036-106	TB2-4	10.88
V10C16	MS3102R36-7S	J3-e	MS25036-153	K2-X2	17.37
X13A16B	MS3102R36-7S	J3-b	13216E6192	CB1-NO	20.62
X2C14A	MS3102R36-7S	J3-x	MS25036-108	TB1-1	12.37
X4C14C	MS3102R36-7S	J3-y	MS25036-108	TB1-3	13.50
X3C14B	MS3102R36-7S	J3-z	MS25036-108	TB1-2	12.25
V13F16N	MS25036-153	K2-X1	MS25036-106	TB2-6	11.49
V8C16N	13216E6191-2	CR1-2	MS25036-106	TB2-6	15.62
X3G12B	MS25036-112	TB1-2	MS25036-112	K1-B1	13.45
X2G12A	MS25036-112	TB1-1	MS25036-112	K1-A1	13.75
X4F12C	MS25036-112	TB1-3	MS25036-112	K1-C1	13.75
X3H16B	13216E6192	CB1-C	MS25036-153	K1-B1	4.30
X12A12A	13216E6191-3	CB1-A1	MS25036-112	K1-A2	10.88
X14A12C	13216E6191-3	CB1-C1	MS25036-112	K1-C2	9.75
V12A16	MS25036-153	K1-X2	MS25036-106	TB2-2	16.24
V13E16N	MS25036-153	K1-X1	MS25036-153	K2-X1	13.24
X2H12A	MS25036-112	K1-X1	MS25036-112	K2-A2	15.01
X3J12B	MS25036-112	K1-B1	MS25036-112	K2-B2	12.75
X4G12C	MS25036-112	K1-C1	MS25036-112	K2-C2	13.65
X4H16C	MS25036-153	K4-D3	MS25036-108	K2-C2	17.00
X4K16C	MS25036-153	K4-D3	MS25036-153	K4-C1	3.88
X2J16A	MS25036-106	XF1-1	MS25036-108	K2-A2	25.38
X13D16N	MS3102R-36-7S	K3-5	MS25036-153	K1-X1	25.37
V14B16	MS3102R-36-7S	K3-2	MS25036-106	TB2-3	18.50
V14A16	MS3102R-36-7S	K3-2	MS3102R36-7S	K3-1	4.00
V12B16	MS3102R-36-7S	K3-3	MS25036-106	TB2-2	18.12
V2A16	13216E6191-2	CR1-3	MS25036-106	XF2-1	6.50
X35A16A	13216E6191-2	CR1-1	MS25036-106	T1-X2	6.75
X34A163	13216E6191-2	CR1-4	MS25036-106	T1-X1	6.75
X33A16A	MS25036-106	T1-H2	MS25036-106	XF1-2	3.75
X31A16B	MS25036-106	T1-H1	MS25036-106	XF1-3	4.25
X20A12B	MS25036-112	CB1-B2	MS3102R36-7S	J3-4	17.50
V8F16N	MS25036-106	TB2-6	MS25036-108	E1	6.75
X31.16B	MS3102R36-7S	J3-A	MS25036-108	TB1-2	10.75
X4L16C	MS3102R36-7S	J3-B	MS25036-108	TB1-3	10.75

No.	Terminal Type	Term. No.	Terminal Type	Term. No.	(Inches)	Size
Wiring Harness — System Interconnecting						
6*	MS3106R36-7P	P3-g		S3-1	46.00	16
6*	MS3106R36-7P	P3-O		S3-2	46.00	16
16C	MS3106R36-7P	P3-V	MS3106R20-27S	P9-C	40.00	16
4C	MS3106R36-7P	P3-y	MS3106R28-11S	P7-K	19.00	14
6	MS3106R36-7P	P3-C	MS25036-153	S7-1	68.00	16
16B	MS3106R36-7P	P3-h	MS3106R36-7P	P7-H	19.00	16
16C	MS3106R36-7P	P3-W	MS3106R20-27S	P9-F	40.00	16
6	MS3106R36-7P	P3-D	MS3106R28-11S	P7-W	19.00	16
6A	MS3106R36-7P	P3-c	MS3106R28-11S	P7-1	19.00	16
16B	MS3106R36-7P	P3-M	MS3106R145-6S	P8-B	60.00	16
16B	MS3106R36-7P	P3-R	MS3106R20-27S	P9-A	40.00	16
16A	MS3106R36-7P	P3-U	MS3106R20-27A	P9-B	40.00	16
16A	MS3106R36-7P	P3-L	MS3106R14S-6S	P8-A	60.00	16
6	MS3106R36-7P	P3-Z	MS3106R28-11S	P7-B	19.00	16
16	MS3106R36-7P	P3-e	MS3106R28-11S	P7-N	19.00	16
12C	MS3106R36-7P	P3-w	MS3106R20-15S	P4-C	31.00	12
12B	MS3106R36-7P	P3-u	MS3106R20-15S	P4-B	31.00	12
16	MS3106R36-7P	P3-H	MS3106R12S-3S	P5-B	35.00	16
16N	MS3106R36-7P	P3-F	MS3106R12S-3S	P6-B	68.00	16
16	MS3106R36-7P	P3-E	MS3106R12S-3S	P6-A	68.00	16
12N	MS3106R36-7P	P3-t	MS25036-157	E3	17.00	12
16	MS3106R36-7P	P3-G	MS3106R20-15S	P4-D	31.00	16
6N	MS3106R36-7P	P3-K	MS3106R12S-3S	P5-A	35.00	16
6	MS3106R36-7P	P3-J	MS3106R20-15S	P4-E	31.00	16
12A	MS3106R36-7P	P3-v	MS3106R20-15S	P4-A	31.00	12
16C	MS3106R36-7P	P3-N	MS3106R14S-6S	P8-C	60.00	16
16	MS3106R36-7P	P3-d	MS3106R28-11S	P7-T	19.00	16
16N	MS3106R36-7P	P3-Y	MS3106R28-11S	P7-A	19.00	16
6	MS3106R36-7P	P3-f	MS3106R28-11S	P7-X	19.00	16
14A	MS3106R36-7P	P3-x	MS3106R28-11S	P7-J	19.00	14
14B	MS3106R36-7P	P3-z	MS3106R28-11S	P7-M	19.00	14
16B	MS3106R36-7P	P3-a	MS3106R28-11S	P7-U	19.00	16
16	MS3106R36-7P	P3-I	MS25036-153	S6-2	68.00	16
16A	MS3106R36-7P	P3-S	MS3106R20-27S	P9-E	40.00	16
16B	MS3106R36-7P	P3-h	MS3106R20-27S	P9-D	40.00	16
16B	MS3106R36-7P	P3-p	MS3106R28-11S	P7-C	19.00	16
16C	MS3106R14S-6S	P8-D	MS3106R28-11S	P7-E	69.00	16

Wire I.D. No.	FROM		TO		Length (Inches)
	Terminal Type	Term. No.	Terminal Type	Term. No.	
	Wiring Harness — System Interconnecting (Con't)				
X9B16A	MS3106R14S-6S	P8-F	MS3106R28-11S	P7-V	69.00
X43B16A	MS3106R36-7P	P3-P	MS3106R20-27S	P9-G	40.00
X44B16B	MS3106R36-7P	P3-T	MS3106R20-27S	P9-H	40.00
X42B16C	MS3106R36-7P	P3-X	MS3106R20-27S	P9-J	40.00
X3M16B	MS3106R36-7P	P3-A	MS3106R20-15S	P4-G	31.00
X4M16C	MS3106R36-7P	P3-B	MS3106R20-15S	P4-F	31.00

* Part of pressure switch assembly

A-1.	Fire Protection TB 5-4200-200-10	Hand Portable Fire Extinguishers Approved Users
A-2.	Lubrication C91001L	Fuels, Lubricants, Oil and Waxes
A-3.	Painting TM 43-0139	Painting Instructions for Field Use
A-4.	Maintenance DA PAM 738-750	The Army Maintenance Management (TAMMS)
	TM 5-4120-360-24P	Organizational, Direct and General Support Maintenance Repair Parts and Special Tools List ing Depot Maintenance Repair Parts and Tools)
A-5.	Cleaning Fed. Spec P-D-680	Dry cleaning solvent
A-6.	Destruction TM 750-244-3	Procedures for Destruction of Equipment to Enemy Use
A-7.	Shipment and Storage TM 740-90-1	Administrative Storage of Equipment
A-8.	Radio Suppression TM 11-483	Radio Interference Suppression

tenance allocation chart.

Column 5, Tools and Equipment. Column 5
ifies, by code, those common tool sets (not in-

section IV, Remarks, which is pertinent to the
opposite the particular code.

(2)

(3)

(4)

(5)

(6)

Order	Component/Assembly	Maintenance Function	Maintenance Level					Tools & Equipmt	Remarks
			C	O	F	H	D		
	<i>Casings & Related Parts</i>								
	Fabric Cover	Install		X					
		Replace		X					
	Top Panel Assembly	Replace		X					
	Gasket	Replace		X					
	Insulation	Replace		X					
	Air Discharge Grille	Inspect		X					
		Service		X					
		Replace		X					
		Repair		X					
	Gasket	Replace		X					
	Air Intake Grille	Inspect		X					
		Service		X					
		Replace		X					
	Gasket	Replace		X					
	Lower Panel	Replace		X					
		Repair		X					
	Gasket	Inspect		X					
		Replace		X					
	Insulation	Inspect		X					
		Replace		X					
	CBR Cover	Replace		X					
	Fresh Air Screen	Inspect		X					
		Service		X					
		Replace		X					
	Condenser Coil	Inspect		X					
	Guard	Service		X					
		Replace		X					
	Condenser Fan Guard	Inspect		X					
		Service		X					
		Replace		X					
	Back Panel and Motor								
	Support	Replace		X					
	Air Filter	Inspect		X					
		Service		X					
		Replace		X					
	Fresh Air Damper	Inspect		X					
	Control	Adjust		X					
		Replace		X					
		Repair		X					
	Mist Eliminator	Inspect		X					
		Service		X					
		Replace		X					

Group Number	Component/Assembly	Maintenance Function	Maintenance Level					Tools & Equipmt	I
			C	O	F	H	D		
01 (Cont)	Block-off Panel	Install		X					
	Instruction Plates	Replace		X					
	Casing Assembly	Repair		X					
	Insulation	Replace			X				
	Drip Pan Assembly	Inspect		X					
		Service		X					
	Lower Drain Tube Assembly	Inspect		X					
		Service		X					
		Replace		X					
	Hose	Inspect		X					
		Replace		X					
02	<i>Control Panel and Junction Box</i>								
	Control Panel	Replace		X					
		Repair		X					
	Selector Switch	Test		X					
		Replace		X					
	Temperature Control	Test		X					
	Thermostat	Replace		X					
	Two-Speed Switch	Test		X					
		Replace		X					
	Junction Box	Replace		X					
	Fuse	Test		X					
		Replace		X					
	Circuit Breaker	Test		X					
		Replace		X					
	Heater and Motor	Test		X					
	Relays	Replace		X					
	Time Delay	Test		X					
	Relay	Replace		X					
	Transformer	Test		X					
		Replace		X					
	Terminal Boards	Inspect		X					
		Replace		X					
	Electrical	Inspect		X					
	Receptacles	Replace		X					
	Rectifier Assy	Test		X					
		Replace		X					
	RFI Filter	Test		X					
	Assembly	Replace		X					

(2)

(3)

(4)

(5)

(6)

Component/Assembly	Maintenance Function	Maintenance Level					Tools & Equipmt	Remarks
		C	O	F	H	D		
<i>Compressor Assembly</i>								
Compressor	Test		X					
	Replace			X				
Compressor	Test		X					
Crankcase Heater	Replace		X					
<i>Pressure Switches</i>								
High-Pressure	Test		X					
Cut-Out Switch	Replace			X				
Low-Pressure	Test		X					
Cut-Out Switch	Replace			X				
Pressure Control	Test		X					
Switch	Replace			X				
<i>Refrigerant Components</i>								
Refrigerant Tubing and Fittings	Inspect			X				
	Test			X				
	Replace			X				
Solenoid Valves	Test		X					
	Replace			X				
Coil	Test		X					
	Replace		X					
Filter-drier (Dehydrator)	Replace			X				
Sight-glass Liquid Indicator	Inspect		X					
	Replace			X				
Pressure Regulating Valve	Adjust			X				
	Replace			X				
Pressure Relief Valve	Replace			X				
Service Valves	Inspect			X				
	Replace			X				
Receiver	Replace			X				
Thermal Expansion Valves	Test			X				
	Adjust			X				
	Replace			X				
Condenser Coil	Service		X					
	Replace			X				
Evaporator Coil	Service		X					
	Replace			X				
<i>Heater Assembly</i>								
	Test		X					

Group Number	Component/Assembly	Maintenance Function	Maintenance Level					Tools & Equipmt	R
			C	O	F	H	D		
06(Cont)	Heater Thermostatic Switch	Test Replace		X X					
07	<i>Fans and Motor</i> Evaporator Fan Assembly	Replace		X					
	Condenser Fan Assembly	Replace Inspect Test Replace Repair		X X X X X					
08	<i>Wiring Harnesses</i> Wiring Harnesses	Inspect Test Replace Repair		X X X X					
	Wire Leads	Inspect Test Replace Repair		X X X X					
	Receptacle Connectors	Inspect Test Replace		X X X					
	Plug Connectors	Inspect Test Replace		X X X					

**Indicates WT/MH required.

Subcolumns are as follows: C-Operator/Crew O-Organizational
F-Direct Support H-General Support D-Depot

REQUIREMENTS

MAINTENANCE ALLOCATION CHART 18,000 BTU VERTICAL COMPACT AIR CONDITIONER

(1) Tool/Test Equipment Ref Code	(2) Maintenance Category	(3) Nomenclature	(4) National/NATO Stock Number	N
		NOTE		
No special tools and test equipment are required. Standard tools and test equipment in the following kits are adequate to accomplish the maintenance functions listed in Section II:				
1	O-F-H	Tool kit, service, refrigeration Unit (SC 5180-90-CL-N18)	5180-00-597-1474	
2	F-H	Pump, Vacuum	4310-00-289-5967	
3	O-F-H	Soldering Gun Kit	3439-00-930-1638	
4	O-F-H	Brush, Bristle	7520-00-223-8000	
5	O-F-H	Brush, Wire	7920-00-282-9246	
6	O-F-H	Bucket	7240-00-137-1609	
7	O-F-H	Heat Gun	4940-01-042-4855	
8	O-F-H	Multimeter	6625-00-553-0142	
9	O-F-H	Pliers, Long Round Nose	5120-00-268-3579	
10	O-F-H	Rubber Gloves	8415-00-266-8677	
11	O-F-H	Safety Goggles	4240-00-052-3776	
12	O-F-H	Screwdriver, Cross Tip No. 2 One Inch Long Blade	5120-00-227-7293	
13	O-F-H	Screwdriver, Offset, Cross Tip No. 1	5120-00-256-9014	

MAINTENANCE ALLOCATION CHART

Reference Code	Remarks
Note 1	Replace gasket insulation and information plat
Note 2	Straighten bent blades.
Note 3	External components only (knobs and switches).
Note 4	Replace components.
Note 5	Replace bearings, thermal overloads or connect
Note 6	Replace solenoid valve coil only.
Note 7	Replace external components only.
	<p>Other than those items listed above there are supplemental instructions or explanatory remarks required for the maintenance functions listed Section II. All functions are sufficiently defined in Section I. Active time listed for maintenance task functions are with the air conditioner in off-equipment position.</p>

c. Scope

This appendix lists Expendable Supplies and Materials you will need to operate and maintain the Conditioner. These items are authorized to you by A50-970, Expendable Items (except Medical, Class Repair Parts and Heraldic Items).

d. Explanation of Columns

Column 1 - Item Number. This number is assigned to the entry in the listing and is referenced in narrative instructions to identify the material.

Column 2 - Level. This column identifies the best level of maintenance that requires the listed item.

e. Column 3 - National Stock Number. This column contains the national stock number assigned to the item; use this number to request or requisition the item.

d. Column 4 - Description. Indicates the full name of the item and, if required, a description to identify the item. The last line for each item indicates the item number followed by the Federal Supply Code (FSC) and Manufacturer (FSCM) in parenthesis, if applicable.

e. Column 5 - Unit of Measure (UM). Indicates the unit of measure used in performing the actual maintenance function. This measure is expressed by a character alphabetical abbreviation (e.g., each (ea), inch (in), pair (pr), etc.). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

(1)	(2)	(3)	(4)	(5)
Item Number	Level	National Stock Number	Description	Unit of Measure
1	F	9150-00-823-7905	Lub. Oil Ref. VV-L-825	GL
2	C	6850-00-264-9037	Dry Cleaning Solvent P-D-680 (81348)	GL
3	F	6850-00-837-9927	Monochlorodifluoromethane, Technical: w/cylinder 22 lb. (Refrigerant -22) BB-F-1421, type 22 (81348)	CY

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C. PENNINGTON
General, United States Army
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CON:

distributed in accordance with DA Form 12-25C, Operator maintenance
nts for Environmental Equipment, Air Conditioners, 18,000 BTU.

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DOPE ABOUT IT ON THIS
FORM, TEAR IT OUT, FOLD
IT AND DROP IT IN THE
MAIL!

COA, 3^d ENGINEER BN
FT. LEONARD WOOD MO 63108

DATE

ICATION NUMBER

DATE

TITLE Air Conditioner, Vertical
Compact, 18,000 BTU/Hr, Keeco
Model F18T2

ACT... PIN-POINT WHERE IT IS

IN THIS SPACE TELL WHAT IS WRONG
AND WHAT SHOULD BE DONE ABOUT IT:

PARA- GRAPH	FIGURE NO.	TABLE NO.	
2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has <u>4</u> cylinders. Change the manual to show <u>4</u> cylinder
	4-3		Callout 16 on figure 4-3 is pointing at a <u>bolt</u> . In the key to fig. 4-3, item 16 is called a <u>skim</u> . Please correct one or the other.
line 20 AM PLEASE			Ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN.

NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

IN DOE. PFC (268) 317-7111

SIGN HERE:

[Signature]

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Compact, 18,000 BTU/HR, Keco
Model F18T2

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PAGE
NO.

PARA-
GRAPH

FIGURE
NO.

TABLE
NO.

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Model F1812

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TABLE
NO.

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TITLE Air Conditioner, Vert
Compact, 18,000 BTU/HR, Ke
Model F18T2

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IN THIS SPACE TELL WHAT IS WRONG
AND WHAT SHOULD BE DONE ABOUT IT:

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FOLD BACK

1 decimeter = 10 centimeters = 3.94 inches
 1 meter = 10 decimeters = 39.37 inches
 1 dekameter = 10 meters = 32.8 feet
 1 hectometer = 10 dekameters = 328.08 feet
 1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .16 grain
 1 decigram = 10 centigrams = 1.54 grains
 1 gram = 10 decigrams = .036 ounce
 1 dekagram = 10 grams = .35 ounce
 1 hectogram = 10 dekagrams = 3.52 ounces
 1 kilogram = 10 hectograms = 2.2 pounds
 1 quintal = 100 kilograms = 220.46 pounds
 1 metric ton = 10 quintals = 1.1 short tons

1 liter = 10 deciliters = 38.82 fl. ounces
 1 dekaliter = 10 liters = 2.64 gallons
 1 hectoliter = 10 dekaliters = 26.42 gallons
 1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .15
 1 sq. decimeter = 100 sq. centimeters = 15.
 1 sq. meter (centare) = 100 sq. decimeters =
 1 sq. dekameter (are) = 100 sq. meters = 1.0
 1 sq. hectometer (hectare) = 100 sq. dekameter
 1 sq. kilometer = 100 sq. hectometers = .386

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .0
 1 cu. decimeter = 1000 cu. centimeters = 81.
 1 cu. meter = 1000 cu. decimeters = 36.31 cu.

Approximate Conversion Factors

<i>To change</i>	<i>To</i>	<i>Multiply by</i>	<i>To change</i>	<i>To</i>
inches	centimeters	2.540	ounce-inches	newton-meters
feet	meters	.305	centimeters	inches
yards	meters	.914	meters	feet
miles	kilometers	1.609	meters	yards
square inches	square centimeters	6.451	kilometers	miles
square feet	square meters	.093	square centimeters	square inches
square yards	square meters	.836	square meters	square feet
square miles	square kilometers	2.590	square meters	square yards
acres	square hectometers	.405	square kilometers	square miles
cubic feet	cubic meters	.028	square hectometers	acres
cubic yards	cubic meters	.766	cubic meters	cubic feet
fluid ounces	milliliters	29.573	cubic meters	cubic yards
pints	liters	.473	milliliters	fluid ounces
quarts	liters	.946	liters	pints
gallons	liters	3.786	liters	quarts
ounces	grams	28.349	liters	gallons
pounds	kilograms	.454	grams	ounces
short tons	metric tons	.907	kilograms	pounds
pound-feet	newton-meters	1.365	metric tons	short tons
pound-inches	newton-meters	.11375		

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
----	---------------------------	-------------------------------	------------------------	----